Art & Eros Magazine

Volume Nine: Summer 2022

Art & Eros Magazine: Volume Nine

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Cover picture: The Belly Dancer by Michelle

If you have a submission for the **Art & Eros Magazine** feel free to contact the magazine. The editor can be contacted at

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Something is Missing from Paradise by Patrick Bruskiewich

"After almost creating Paradise on Earth, God … annoyed by the cries of the Cicada …

and tired out by six days of earnest effort took a break and spent Sunday pondering Pure Mathematics.

God knew that Pure Mathematics had few practical applications and thought it would be pleasant to do some applied mathematics … geometry in fact …

Something is missing from Paradise God thought … so starting with straight lines, rectangles and cylinders… he unravelled things …

God set upon his penultimate design, quickly got bored, borrowed a few bones from man's rib cage and said,

Time to move onto spheres, pleasant curves and topology …

Perhaps that's how God came by creating woman after man?

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Prologue

Obelisk Press of Vancouver is delighted to publish the summer 2022 edition of ***Art & Eros*** Magazine which serves to feature the work of aspiring artists.

In this edition we have an interview of Tayler Hutton and some of her art. Aki has sent us two poems from Tokyo. Michelle and I challenge Nanotechnologists to make SANTM which can make multiple and perfect copies of Snowflakes. A sketch by Michelle graces the cover of this edition.

In this edition of ***Art & Eros*** Magazine have as well some stories about the remarkable mathematician John von Neumann, as well as an anthology of Science Fiction in the early part of the 20th century. We also have a short piece by H.P. Lovelace, and some poems by D.H. Lawrence and Wendy Cope.

Art & Eros Magazine welcomes submissions on a quarterly basis. Please feel free to submit your short stories, prose, poetry and artwork to

pbruskiewich @ gmail.com

There is no fee to submit. There is no writer's fee provided by the journal for those who submit. The publishing rights remain with the writer.

Featured Interview

Interview of Tayler Hutton

Patrick: Good morning Tayler. How are you this morning?

Tayler: I'm good. Thank you, Patrick. How are you doing?

Patrick: I'm doing very well. Welcome to the Atelier. Thank you very much for agreeing to be interviewed for Art & Eros. You are a West Vancouver artist with many artistic styles and sensibilities: representational in some ways, expressionist in others, colorist, and someone who's interested in texture and textiles. I think our interview will be rather interesting for readers. Let's begin by asking you to maybe define a bit of your artistic character and your artistic sensibilities.

Tayler: I would say my artistic character and sensibilities are two, as an emotional artist I think art is an emotion. I think that through the process of creation I'm putting myself on the page, I'm putting my experiences on the canvas. Thats the first part of it. The other half is my attraction to certain stimuli, texture, color, shapes. I find these elements all contain emotions, they elicit them in their observer in an individualized way. Which allows a work of art to both have the artists emotion/experience as well as the individual viewers emotion/experience. This means of course that the meaning and purpose of a work of art is different for everyone, its experiential, its phenomenological, its innately and uniquely human.

Patrick: So for you emotion plays a central role in your arts? How do you express emotion in your artistic practice? How do you express it when you're doing a painting? How do you express it when you're doing encaustic wax? How do you express it when you're doing sketches? Or these other things? What are the different ways in which you express this emotion that is central to your artistry?

Tayler: My ideas about expression of the self through art are influenced by Canadian Philosopher Dr. Marshall McLuhan. McLuhan has this idea of objects being an extension of the self. He explains this idea with an example of the pencil, the pencil is an extension of our hand, which is an extension of our bodies which is an extension of the self. Any object that we use is an extension of ourselves. So I feel that when I get a paintbrush, and I'm painting or I'm using whatever materials(encaustic wax, embroidery thread, paint, felt, wood, or my hands) I'm expressing myself through the medium. In this way my paintings are an extension of me.

Patrick: So you're you're referring to Marshal McLuhan, the Canadian Marshall McLuhan. As my apologies, Marshall McLuhan, I guess he's famous for the media being part of the message is that the medium, the medium is the message.

Tayler: That's another one of his thoughts, this idea of the medium being the message could also be incorporated into my conception of art. I think I discovered about McLuhan when I was in my second year of my communications degree. And I just really resonated with his thoughts and the way he describes things so differently. It took a while to understand the

concept at first. But I like difficult concepts. And once I understood it it gave me a different view of art and kind of allowed me to express myself even more fully, without judgment, I think, because I do struggle a lot with perfectionism. So trying to allow myself to be free and express myself without critiquing, or thinking it's not good enough is one of my biggest challenges. But I think knowing that art is emotion and art is expression reminds me that critiquing and limiting it before it is completed is harmful.

Patrick: Well, I think perfectionism is a thing that most true artists have, and that is hard to share their sensibilities with the rest of the world. I should maybe ask you, did you grow up here in West Vancouver? You probably went to school here. You mentioned a moment ago, Capilano University and the degree that you took there? Would you like to share a bit of your life with the readers?

Tayler: Um sure, I grew up in West Vancouver, few blocks from where I currently reside. And it's been nice to live in the space where I grew up. It feels very reminiscent of my childhood for me which sort of helps to enliven my inner child. I went to a couple different private schools. I went to Collingwood for primary school, I went to Mulgrave for middle school, other than grade six when I lived up in whistler for a year where I went to spring creek elementary. I completed my schooling actually at a private Christian school in New Westminster called Carver Christian, its no longer operating. My mom is very religious and wanted me to go to a religious school. I never really I had enjoyed schooling until I went to University, I found it hard to apply myself to things I wasn't interested in, I'm neuro-divergent and need to find some sort of connection to the materiel in order for me to be able to apply

myself. Because of this I had a hard time focusing, I spent most of my time reading books and making art. I always struggled a bit with friendships with kids my age because social skills do not come naturally to kids on the spectrum, however I've always had very good relationships with my teachers, they've always sort of been my best friends. I really love the dynamic of the mentor mentee relationship, the way that you're able to grow and learn from each other. And I've had a lot of very influential teachers. University brought the blessing of self directed study, I got to pursue classes that interested me and because of this I loved it and I really excelled. I graduated from Capilano University with distinction and earned a bachelors in communications earlier this year.

Patrick: Do you stay in touch with your teachers?

Tayler: I do. I've befriended many of my university teachers, we email back and forth. I befriend a lot of people. I really am a big fan of people. I think (a wonderful sentiment told to me by Dr. Micheal Markwick) that everybody is a unique experience that's never going to happen again. Isn't that sentiment lovely.

Patrick: So your art is central to your personality. Do you do writing? Do you write poetry? Do you write prose?

Tayler: Yes, I write poetry and I write short stories too at times. I Find it hard for me to start things sometimes, it's a neuro-divergent thing, bad at task initiation. But once I start doing it, I realize how much I love it and how passionate I feel when I'm doing it. I find poetry is my favourite form of

writing. Because it's shorter. And it can be more abstract than the structured narrative structure of a story. Most of my thoughts are rather abstract so this format works for me. I like unique words, things you don't hear often. I love abstract thoughts, ones that need to be experienced to be understood. I'm a bit of a phenomenologist, which is to believe that you need to experience the thing in order to know what the thing is, this is the basic essence of phenomenology, another idea introduced to me by Dr. Micheal Markwick.

Patrick: I have not read any of your stories, but I've read three of your poems that you've submitted for magazines, which will be published. Do you write stories based on your life experiences? Or do you write stories about things that are outside of you and have nothing in common with your life?

Tayler: When I was younger, I wrote a lot of fantasy. I love fantasy. I love whimsical and magical things and in my childhood I was really into the idea of exploring the unreal. More recently, I'm writing about experience. In my more mature years my focus of exploration is more founded In the real, exploring the inner self through outward expression.

Patrick: So your focus is more on the real world now instead of fantasy?

Tayler: Yeah, when I was a child I was more focused on fantasy. And now I'm more focused on what's concrete and what exists in us.

Patrick: Is there a particular moment in your life where you started to drift from fantasy and to the more realistic world? Is there a point in your life where you say, well, fantasy is my past and reality is my future.

Tayler: I would say actually, that point probably hasn't even come yet. I'm still am very much so rooted in the fantasy and focused on fantasy in my daily life. I think fantasy is a very valuable thing.Thinking or imagining a better life and believing it is possible is a very useful tool for maintaining the human spirit. I think that's really important. Because happiness isn't something that happens to you, happiness, I think, is a decision. When you wake up, you get to decide how you feel, you can focus on the negative things in your life and feel badly or you can focus on what's good, on possibilities, and be happy. Nobody has a perfect life, that's not what makes you happy. Its focusing on the good in life and deciding to be happy about the blessings rather than sad and fixated on the negative things. I think you know, making art is one of the things that really just makes me happy. When I'm doing it, I'm just feel so happy. There's nothing else I'd rather be doing, and through it I can make something that's beautiful and makes other people feel happy. And that's kind of my goal in life—to make people feel happy, to feel free, to realize that they're allowed to be who they are and that that person they are is amazing.

Patrick: Do you think most people are loath to admit that there's happiness inside of them?

Tayler: I think so. I think a lot of people hold on to misery like an heirloom, they take pride in being miserable and think they have earned it more than others. A lot of people say to themselves I'm going to be unhappy, and I think a lot of people get pleasure out of being unhappy, being angry or having these sorts of negative emotions to hold onto. Perhaps its just a learned behaviour, their parents were miserable and now its their turn to be miserable. I think it's

very natural to have different emotions. You can't be happy all the time. But to live in a happy state and to sort of, you know, embrace happiness and positivity is way more rewarding. In life you need to look on the positive side of things and do the things that bring you happiness.

Patrick: I think that's a marvellous philosophy. I'm a bit of an existentialist, although I'm fundamentally Catholic. And so I think to some degree we have freedom to define our personalities in and above our basic responsibilities. And I have noticed, most artists that I interact with are happy to some extent, but not always happy to the fullest extent. Part of what our magazines are about is to try to convey that kind of Utopia and a happy sense because the world of course, is full of unhappiness. And if we dwell on that, that's not good for us as an individual and not good for us as a society. You mentioned Marshall McLuhan did your introduction to him, occur at CapU or did you come across him in high school, and when you began to appreciate his philosophy, did that have an impact on you as an artist.

Tayler: I think for sure, I was introduced to McLuhan, first of all, from Dr. Kimberly Stewart at Capilano University, she is a brilliant woman and one of my, one of my heroes, she's just so, so smart. Of course I can't recall which course it was, I've taken quite a few courses with her. But she's a very brilliant, very lovely lady. She introduced me to McLuhan in the class, I will always remember the class, where I was taught about this idea of the media as the message, she had us go outside and collect some leaves, and we brought it back inside.Then we had to do two drawings of it, one where we "trace" the leaf where we're looking at the leaf, and then we're looking at only a close up part of the leaf, where we're not looking at the whole image of the leaf, we're

just looking at a part of the leaf. This showed us that how we portrayed the leaf or “the message” was the message, a small part of the leaf didn’t convey the same message as the whole image of a leaf that we saw in our drawing. we saw that even though it was the same object we were drawing, It was different when we looked at it different ways, it was different depending on whether you used a pen or a pencil, it's the medium and what elements that the artist includes of the image that provided the message. The portrayal was the message, the medium was the message. I think that definitely changed the way I see art, and the way I see everything. It made me really consider the medium in the message.

Patrick: You mentioned earlier that the moment you pick up a pencil or a paintbrush, it's an extension of you. Yes. Is that an extension in the sense that it's a bridge from you to your medium? Or is it you connecting directly into the medium? Is there still that divide between you as an artist and the medium you're working in? Are you one with your artistic practice and artistic self? Do you lose yourself in your art?

Tayler: Absolutely. I hyper focus when I do art, it’s the only thing I'll just spend hours and hours and hours on. I just lose track of time, it flies by – I become one with the piece, I feel like that is me that is going on to the canvas, that the paint becomes the medium of meaning. If I'm doing felting , this wool feels like it's me that I’m sculpting, I feel a very strong connection to fiber arts, my heritage is mainly Scottish and my family came from the lower lands of Scotland, sheep farmers. So I think I have that connection in my blood, the way it feels my hands, the feeling of creating something physical, something that exists as a three dimensional object in our three dimensional world, is the

most satisfying for me. There's something about translating my experience to an object that takes up space in our world the same way that a human does.

Patrick: Is that something that is inherently part of your family life? Or is that something that was brought into your artistic practice from outside? Like, did your grandmother introduce you to this?

Tayler: It was mine. I've never had a relationship with my grandparents. I live far away from them, my grandfathers both passed, and my grandmothers each had dementia and narcissism, they exited my life when I was quite young. So with the felting, with the fiber arts, I definitely found on my own. I saw something on an online people where artists were felting things and I was thought, I'd love to try that. That looks adorable. It looks like fun. And when I first tried it, I loved it. Its such a visceral physical expression, the feeling of stabbing the felting needle into the felt. The sound and feeling of "crunch", the moment it tightens together, it's a very ephemeral moment. you can feel it in your soul, or at least I can. It just feels, it just feels right when I'm doing it.

Patrick: So texture and textile and touch and sound and all these things, imagined smell and aroma and all these things. It's very much you, you are including all the senses in your art, which is very rare for an artist to do. And I can see that you are someone who freely wants to explore the artistry and discover the beauty of different things. Do you plant and grow flowers? Do you know these other things? And when you do, like bake bread or something like that, do you look for the beauty in things as you do these other things?

Tayler: Oh, absolutely. I think first of all, my number one favourite thing to do in life is to appreciate beauty and to look at beautiful things. Everywhere I go, I'm always noticing this or that, or commenting on how lovely this or that is. I'm constantly appreciating the beauty in everything. I think that's one of the keys to happiness, to appreciate the beauty in life, the beauty in little things, the beauty in everything. I love flowers. I love planting flowers. I do have hungry critters that live nearby me that often come and eat my flowers. I thought, for a moment that someone in the neighborhood had a vendetta on me, but as I try to do no harm, I couldn't imagine who would do such a thing, so I know now it's nature, you're getting a meal, It's okay. And I recently I planted flowers and I forget what they're called, but ones that are supposed to attract hummingbirds, red ones.

Patrick: Last year, I tried to plant sunflowers here, outside the Atelier and the squirrels dug them all up, it was a meal to them. And an amusing moment for me and not a single one of the sunflowers survive. Now, I'm going to this year, plant the seeds and grow them a bit so that when I plant them in the ground, they might be four or five centimeters tall, and therefore this squirrels will leave them alone. You can't get really angry at them. But that's it's a bit annoying. What are you working on presently? What are some of the pieces you're working on presently?

Tayler: Presently, I'm sort of working on my place, kind of turning it into an expression of my art.

Patrick: So this is sort of an art gallery.

Tayler: Exactly. Yes, this is sort of my gallery. I've been doing very textured pieces, most recently I've made these canvases that sort of look like a tree (the texture of which I've made with polymer clay). And then I add moss and I felt little mushrooms put them on, as well as a string of tiny lights woven amongst the mushrooms. These pieces are sort of lamps for my bedroom.

Patrick: Mixed medium ...

Tayler: Yeah, mixed media has a lot of pull for me. I've really enjoyed mixing mediums, I really enjoy it, every time I learn a different medium, it gives me new skills and abilities that I'm able to apply in other mediums. I especially love when I'm able to mix a couple of different mediums together and see the different effects I'm able to get, especially when I apply techniques from certain mediums to other mediums that they translate to. I think you can bring a different mindset to a mediums when you apply another mediums sensibilities to it. When you learn a new medium, you can use those techniques in a different way if you choose, you don't need to use those skills for that specific application. And I think it's part of exploring and sort of seeing what you can do. Seeing what YOU can come up with is very important. I'm mostly self-taught and I don't really like to be taught with art, I think it should be— or at least for me—I feel like my art should be exactly what I want it to be. What I see to be done with the paintbrush, what I think should be done with the paint, with the colors, with this and that, I don't want to come into it with someone else's ideas of art or how it is completed. I want to create authentic art that is an expression of myself, not of some other teacher (no matter how exceptional they may be at creating art).

Patrick: Is the journey for you more important than the final destination? It's the little process of discovery, the whole process of the art, artistry and science behind your your art.

Tayler: Absolutely. I think discovery is a huge thing of it. I almost never have an idea of how I want a painting to look when I start.

Patrick: I was about to ask you that because that's also an indicative measure of the philosophy of an artist. You know, is it an exploration from the moment you put the first dab of colour or bit of mixed media on your canvas? Or do you know where you will end up? And what you saying is no, it’s, discovering it is part of the fun.

Tayler: Yeah, that's, that's most of the fun I think. I never usually have an idea or setup. Sometimes I'll take some colours that I'm drawn towards, or some textures I’m drawn towards. And I'll work with those, but usually I just kind of start painting it, and I see what the painting wants to be, what the painting needs to be, as kooky as it sounds I listen to what painting is telling me it is. It usually wants to be something, that’s the sort of self discovery element of my art what I feel like needs to go next ...I'll think how am I feeling right now?

What colour, what texture conveys this feeling? I will make the choice of the way I apply the color, the texture I choose, all of that is based on what feels right, for the expression, which I often can’t identify until I see the finished piece.

Patrick: So am I to understand that occasionally, art is a form of therapy, because there's unhappiness or disappointment? Or is it art to a way of sorting out one's own inner sense that you can actually get on with life? Is that part of your art as well?

Tayler: Absolutely. I was originally studying to be an art therapist, I changed my mind because I don't have that ability to separate my home life from my work life, I take stuff home, and I don't think I could handle the emotional intensity if I were to have a client who were to end their life or something along those tragic lines. But I do believe that art is therapeutic. For me, it is very therapeutic. And I think it can be therapeutic for anyone, through either the creation of art or through the viewing of art. We know there's unique and individual significance to art that exists solely in the perception of the individual. That's my favorite thing about art, that it's subjective. The meaning of a work of art is truly up to viewer, that's really the only true meaning to be found in art, what each individual person takes away from seeing it. The meaning is a culmination of the viewers history, their experiences as a human applied to the context of the work.I think it's a good reminder, too, that, you know, we all have our own perspective of what reality is, but none of us really know what reality is, we all have our own view and perspective of reality, and everyone's reality is different. Everyone's vision is different, maybe we all love the same colour, we just see it differently and have different names for it. I always wonder if people see colours the same way.

Patrick: I used to teach a Foundation Course at Emily Carr and one of the things I taught my students is every person has a different colour perception. And it has to do with the variety and variation in our optical system, not just

our eyes, but also the way our eyes are wired into the occipital lobe of our head, where we do the processing. So at the end of the day, if you wish to hear my conclusion, the answer is everyone perceives colour differently. And when you add to that, the emotive side, emotional side, which is part of nurture/nature and means we also react to colours differently. And women react to colours differently than men, younger kids differently than older people. It's quite an interesting dynamic. What we may not appreciate as a young child we may appreciate as someone older and what we lose in our appreciation of arts definitely can be seen as people get older as well. We (adults) tend to become structured in our views of things when kids are explorative.

So if you have to choose an artist or two that have been most influential in your artistic practice, are there is there an artist or two that you've drawn inspiration from?

Tayler: Absolutely. Most of the artists that have inspired and influenced me the most have been artists that I'll see on Instagram. I really like contemporary artists, and I really like abstract art. I really like Rothko pieces. I've seen a couple of them in the flesh when I was in Montreal and just standing in front of them feeling the emotion of the colour. I think his pieces sort of really started my love affair with colour. I just realized by viewing his works, how much colour can evoke an emotion, how much colour can convey emotion, how amazing a vessel for emotion it can really be.

Patrick: Are you very much influenced by social media?

Tayler: I'd say yes and no, I don't think it would directly influence my works, but it's very much inspires me. I'll see maybe like a colour or texture or a shape or something in it that makes me think of an idea, it makes me think, Oh, what if I tried this? What if I do that? And I think that's a huge source of inspiration for me, as I'll see what other people are doing. And I get my own ideas. So yes its inspiration, but it isn't the work in itself that's inspiring me but rather an element that inspires me. I usually see finished works as finished and possessed by the artist who created them, I don't see any value in recreating what has already been created.

Patrick: Well, to some extent, you've explained the diversity of your art because you're exploring, you're an exploratory artist drawn by the emotions of things. And I think that's a rarity amongst artists here in Vancouver. I think, at least, artists here, they tend to decide to focus in one area and then kind of walk too far down that road before they realize, well, it's a solitary road. But it sounds like you are exploratory, that you look at different possibilities. You want to explore them, you want to understand them, you want to teach yourself how best to express that art. I imagine you have quite a large collection of art, which you've shared with other people and I imagine your studio is probably full of works in progress, am I kind of close to expressing a bit of your sensibilities as an artist?

Tayler: Most of my home is just filled with art supplies and canvases, I've got finished canvases leaned against every surface, and more wood ones stacked in my corner and all my cabinetry in my kitchen ia filled with art supplies and finished pieces, just ask my fiance. Oh my god, it's just art piled everywhere

... art on the walls …art on the floors, art everywhere, and its just, art everywhere, everywhere is art.

Patrick: Or most of your close friends artists?

Tayler: No, actually, I have a few friends who do art. I never really went to art school, I did one year of art school where I regrettably didn't apply myself, some nonsense about directed study removing the spontaneity of creation. most of my friends do social work and are social workers, helping children, young folks who have begun to tread down the wrong path.

Patrick: What would you like to share with our readers? I won't ask you a question. Other than that, what would you like to share as your last thoughts with our readers? Any advice to give them, any suggestions, any you know, cautions?

Tayler: I would say, I was just thinking about this thought the other night, how you've got to be your favourite. And if you're not your favourite, what are you doing. You've got to do the things that are you. You have to be the person that you are. You need to be your authentic self. You can't deprive the world of the beauty and joy that only *you* can give. You can bring so much beauty and joy to the world by being your authentic self, by being happy, by living authentically, passionately, and truthfully. When you don't do this, you're just depriving yourself of a life worth living. I came to this realization recently, after I found out I had a diagnosis of an inoperable brain tumour. When you get a terminal diagnosis, you sort of put things in perspective. It's a blessing in disguise because it's really made me live passionately, and kind of prioritize

things that I want out of my life. It’s unusual for someone of my age to have these thoughts, being a young person of 27. Usually people don't think about this until they're a bit older. But when you get terminal illness like this, you have to evaluate what's important, and what you want to have as a part of your life. And what's important, I think in life, is love and happiness. Seeing each person be their bold, authentic self, to be happy, and to realize what it is that they're here to do.

Patrick: Well, that is very profound philosophy. And I know the people who sit and read your words when they get to this point will probably be in tears because that's a philosophy that is very unique. And, you know, I am Catholic and I have to say that someone from Heaven is smiling. Thank you very much for sitting and coming for an interview. And we will be featuring not only your interview but we will be inviting you to share with us your poetry and your prose and your arts so that we can allow you a platform to express yourself to the rest of the world.

Tayler: Thanks so much for this opportunity Patrick, I hope my words resonate with the readers and my philosophy can inspire them in their own way.

Art by Tayler Hutton


GOLDEN

New Prose

Ultimate Nanotechnology Challenge: Building Identical Snowflakes

by Patrick Bruskiewich* and Michelle Chan
* Director, Vancouver Institute for Advanced Studies

Abstract

In this paper we present the ultimate challenge to nanotechnology researchers – build self-sufficient nanotechnology machine (SANTM) that can produce multiple identical copies of *Snowflakes*, with an error of less than one part in a billion.

Room at the Bottom and Nanotechnology

In a landmark lecture given by physicist Richard Feynman at the annual APS meeting at Caltech on December 29th, 1959 titled "*There's Plenty of Room at the Bottom: An Invitation to Enter a New Field of Physics*" a challenge was presented to build micro-technology machines. These machines were on the scale of micrometers. [1]

It is said that half the wealth generated in the 20th century derived from the application of Quantum Physics to micro-technology scaled practical applications. In the over six decades since Feynman presented his challenge physics has progressed from micrometer scaled machines to nanometer scaled machines.

In the past century the science of computing and *Artificial Intelligence* have developed sophisticated thinking machines that are fully programmable in the sense of either Von Neumann machines that are self-replicating [2] or thinking machines as outlined by Alan Turing. [3]

We now build machines at the scale of nanometers. It is predicted that 75% of the wealth in the 21st century may draw from nanotechnology. Now it is time to push the science of nanotechnology into a realm that is at the cutting edge of nature's natural beauty.

The Snowflake Challenge

In a handful of places in modern science man-made things have been produced that we do not find in nature – e.g. glucose molecules with the 'wrong handedness,' Technetium used in nuclear medicine and chlorofluorocarbons compounds used as refrigerants, to name three examples.

It is said that no two *Snowflakes* are ever identical and are themselves transcendental. *Snowflakes* are fractal objects that are built up by random physical processes that depend on simple phase dynamics.

The ***Snowflake Challenge*** is to build a self-sufficient nanotechnology machine (SANTM) that can produce multiple identical copies of a Snowflake template, with an error of less than one part in a billion.

Ideally the machine should be able to draw water out of the air, chill each molecule and place it into a structure that can be replicated with a high precision and accuracy.

The self-sufficient nanotechnology machine (SANTM) may be powered remotely. Chromophores may be a possible transfer mechanism for remote powering. Ideally these SANTM would be mobile and not fixed structures.

The SANTM must have its primary CPU internal to its structure. They should be reprogrammable remotely and be self-learning in certain functions core to its purpose. The SANTM may dialogue on a periodic basis with an external CPU in a manner that is secondary to its primary function. They must have finite lifetimes and not represent a harmful mechanical creature to existing living creatures on Earth. The SANTM shall be programmed to follow Asimov's Three Robotic Laws.[4]

The SANTM should be able to self-correct any errors in the placement of the water molecules on a continuous basis so that the end product is as anticipated by its programming to an accuracy of better than one part in a billion. What is not wanted is a machine that will make many copies with errors in the oft chance a handful of the end products meet the template programming. Many varieties of snowflakes of progressing complexity should be allowed as a template.

Such SANTM could be adapted for many other practical applications, such as building high impulse efficient solar sails for interplanetary and interstellar

exploration, or building and maintaining space elevators. SANTM could also be used for terraforming of planets such as Mars, Venus and moons. Such SANTM could also produce foodstuff and pharmaceuticals.

With an ever increasing population, humanity is in a foot-race with catastrophe. Left unchecked there may be as many as 30 billion humans on planet Earth a century from now. SANTM that can meet the ***Snowflake Challenge*** may help to mitigate such a catastrophe.

References:

1) Feynman, R, *There's Plenty of Room at the Bottom*, https://web.pa.msu.edu/people/yang/RFeynman_plentySpace.pdf

2) Refer to: https://en.wikipedia.org/wiki/Von_Neumann_architecture

3) Refer to: https://en.wikipedia.org/wiki/Alan_Turing

4) A robot may not injure a human being or, through inaction, allow a human being to come to harm. A robot must obey orders given it by human beings except where such orders would conflict with the First Law. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

A Tribute to Stephen Hawking by Patrick Bruskiewich

Professor Hawking passed away in March, 2018. The following tribute was sent to the Vice-Chancellor of Cambridge University Stephen Toope:

Stephen Hawking is standing before the gates of heaven …

In surprise he exclaims

'My God I am standing …'

He looks up and sees the pearly gates and wonders aloud

"But why am I here? I don't believe in God!"

At which point a voice from on high responds …

I know …but it has been a long time
since I have had a good conversation.

Finely Distinguished Knowledge by Thomas Cairns

> *"'Sir,' said Stephen, 'I read novels with the utmost pertinacity. I look upon them – I look upon good novels – as a very valuable part of literature, conveying more exact and finely-distinguished knowledge of the human heart and mind than almost any other, with greater breadth and depth and fewer constraints.'" (p. 253, The Nutmeg of Consolation, Patrick O'Brian).*

The addiction was immediate, and quite accidental. A few innocent pages into Patrick O'Brian's extended narrative about "Lucky" Jack Aubrey, post-captain in His Majesty's Royal Navy, and his friend Stephen Maturin, ship's surgeon, naturalist and spy, and I was irretrievably snared. Granted, I am especially susceptible to getting caught up in fictional webs characterized by the clatter of a chaise-and-four running over the cobblestones of foggy London streets, the smell of gunpowder and the roar of cannon fire, and the deliciously tense formal restraint of a certain class of society in early 19th-century Britain. The 21 sequential novels published over 30 years have been called "the best historical novels ever written," and while I might not go so far as that, for such energetically plotted adventure stories they conceal a surprising amount of depth and nuance.

The Aubrey-Maturin stories achieve their addictive quality through a number of devices – the characters are complex and multi-faceted, the historical detail is almost excruciatingly exact, and a wonderfully dry wit saturates the narrative. In addition, the central relationship between Captain Aubrey and

Dr. Maturin, more than any naval battle or domestic intrigue, gives the books a compulsive momentum and emotional core. But, I would argue, what ultimately defines the novels and makes them worthy of further reflection is the brilliance of O'Brian's language.

The books are a fantastic web of complex language, defined by rhythm, cadence and peculiar obscurity that form a complete narrative world. A new reader of O'Brian's works will recognize his significant debt to Jane Austen and also the unavoidable fact that there are moments when the books are entirely incomprehensible. O'Brian regularly uses Napoleonic era naval jargon without any definition. This is not the cartoonish "ahoy matey" and "yo-ho-ho" of pirate movies, but an intricate world of specific terminology, purposely unintelligible to the reader. It is clear that O'Brian recognizes that most readers might be a little foggy on just what the "sprit-sail yardarm" might be, or what exactly the bellowed order "boom him off the backstay" might entail. But he clearly delights in the immersive properties of the language, buoying readers along in their vaguely amused ignorance by brilliant use of rhythm and cadence.

In this way, the form of the novels mirrors the world described within them – the world of Napoleonic Europe with its strict societal and cultural codes of language and practice, and more specifically the rituals and language particular to the Royal Navy itself. A recurring feature in the early books is the introduction of new crewmembers to Captain Aubrey's ships – frequently men who have been "pressed" from local prisons or picked up off the streets to aid in the national struggle against Napoleon. These "landsmen" are

typically a “stupid, unhandy set of lubbers on the whole,” and tend to be useless as sailors, at least at first, finding the network of naval language that surrounds them just as incomprehensible as the reader does. Yet, over time, as the landsmen become initiated into the life of the ship, they demonstrate not just comprehension of their new world, but become actual participatory members of the community. As previously foreign rituals such as exercising the great guns in the evening and swabbing the deck each morning before dawn become embodied practice, the landsmen undergo an unconscious transformation into naval sailors, ready to crack on under close reefed topsails in a fierce squall or drive an axe into a French officer’s thigh when boarding an enemy deck.

In this way, the Aubrey-Maturin novels are rather brilliant reflections on the relationship between identity and the uncertainty of human life. The strange language of the Royal Navy and its complex of holy practices are not extraneous to the sailors and ships, but actually constitute the floating worlds that glide along the ocean’s surface, seeking opportunities to erupt into thunderous violence against the enemies of good King George. The members of a sailing ship are unusually aware of the radical insecurity of life as they depend on the vagaries of currents, winds and the integrity of the tar, wood and canvas constructions which propel them to the far sides of the world. The language and rituals which define the lives of those immersed in them are meant to create a certain type of character, a certain set of virtues, so that when luck turns sour they will still be able to tie a crowned double-wall knot in the midst of heaving swell.

Part of the attraction of the novels, of the roots of their addictiveness, of my frankly embarrassing love for them, is due to the incomprehensible language and not in spite of it. There is a certain appeal in the fact that a reader can see in a more explicit way what often remains hidden: namely the complex framework of language and repeated practices that shapes our own characters.

As the quote at the beginning of the essay states, fiction has a way of conveying an "exact and finely distinguished knowledge of the human heart and mind." Even pulse-pounding serial adventure stories like the Aubrey-Maturin novels can prompt us to imagine ourselves using new language. Crossing the boundary of fiction and undergoing immersion in a distinctly different world forces us to question what implicit networks of language and ritual practice we are enmeshed in, and what sorts of virtues these practices and languages are shaping within us. Not to say that the mystery of who and how I am becoming can ever be exhausted, but the questioning is not entirely in vain: a particular nakedness of self is exposed when the bewildering drunken veering of life collides with our best laid plans, when a mysterious ship appears hull up on the horizon, or when a confused, tumbling cross-sea tosses us in unexpected directions.

{First Published in This Great Society Oct. 2011}

More than a Letter divides 'Languish' from 'Anguish' by M. Mohr

An article in the New York Times recently suggested that languishing – a state of being distracted, feeling unmotivated, muddling through one's days – might be "*the dominant emotion of 2021*." It prompted etymological speculation in the online comments. "*Why is the word anguish inside of languish? Is l for lazy*?" a reader from Wisconsin wondered. Another from New York joked that *languish* was just *anguish* but "more French. OK! *L'anguish* it is."

In may seem that these two words must be related, but etymologically they are more like opposites than cousins. Languish comes from the Latin verb *languere*, "to be faint, feeble … idle, inert ... *Languish's* roots suggest a lack of tension, and its English relatives are floppy words like *relax*, *slack*, *lax*, and possibly even *sleep*. It can also be defined "to become feeble" … and "to suffer neglect" … according to Merriam-Webster.

While *languish* is loose, *anguish* is constricted. It comes from the Latin *angustia* ("narrowness, lack of space"). Appropriately enough, its English relatives include *anger* and *anxiety*.

In more roundabout ways, both comments on the Times article hit on something true. Languish did arrive in English from the French – Anglo-Norman, to be exact – along with *pork* and *beef* and other high-status words during the Norman Conquest. Anguish arrived in the same way at the same time, though, so one isn't more French than the other.

And just as the Norman *pork* and *beef* joined the Old English *swine* and *cow*, English already had a Germanic word that did much the same job as *languish* – *sloth*. Today we associate *sloth* with laziness; Merriam-Webster defines it as "disinclination to action or labor." In the Anglo-Saxon and medieval periods, it bore a closer resemblance to languishing. Sloth was used by early Theologians to translate the Greek *acedia* ("without care"), described by medievalist Seigfried Wenzel as "exhaustion and listlessness caused by the monotony of life and the immediate surroundings." *Acedia* affected the desert-dwelling monks, who had committed themselves to solitary lives of prayer but sometimes had difficulty feeling the spiritual joy that was supposed to accompany their devotion.

While the "l" in *languish* doesn't stand for "lazy", the two aren't semantically unrelated. However interesting *languish* and *anguish* are as words, though, I hope that if there's a dominant emotion of 2021, it's a different one from Normal French – how about *comfort* or *delight*?

{First Published in CSW, May 17, 2021}

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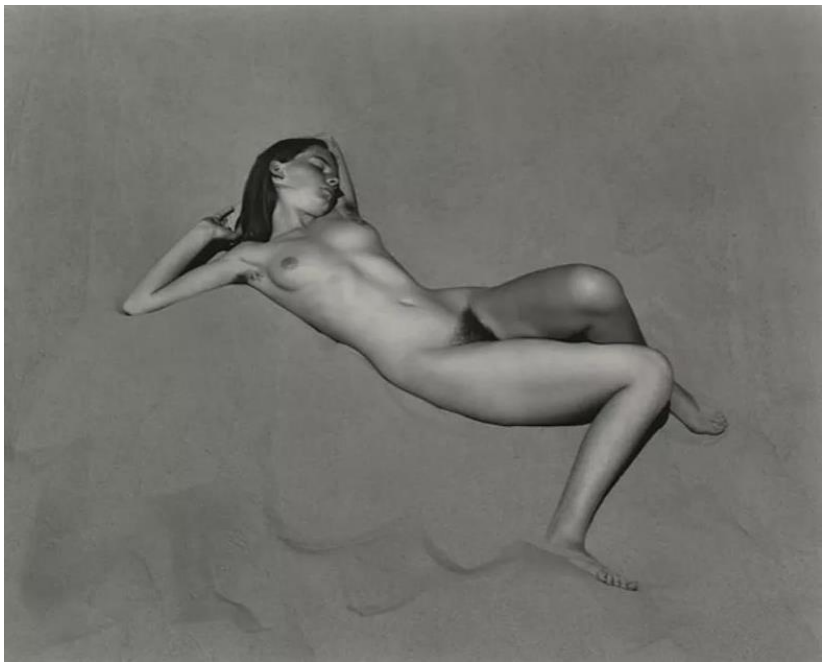
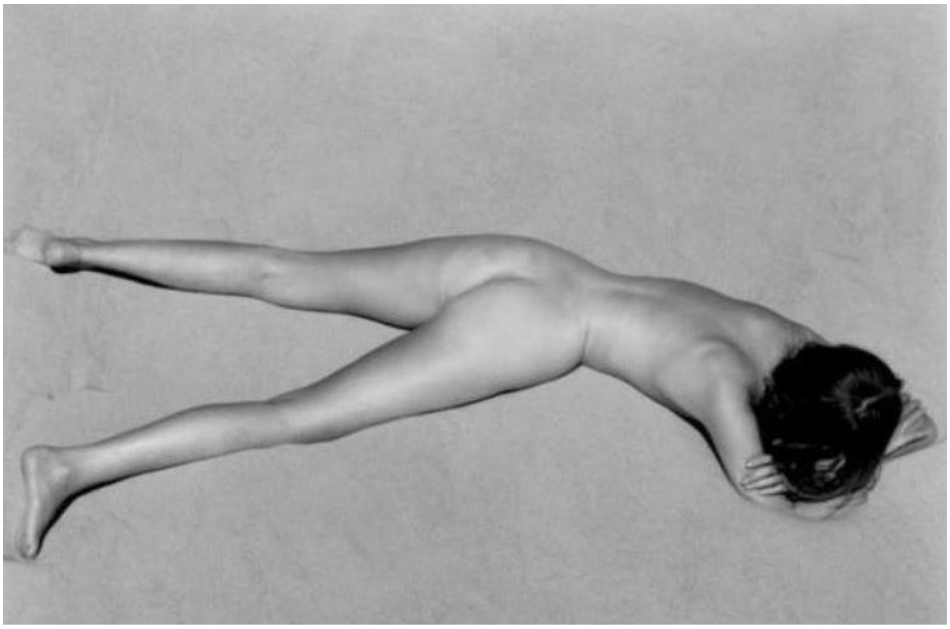
Editor in Chief: Patrick Bruskiewich

Something to Reflect On …

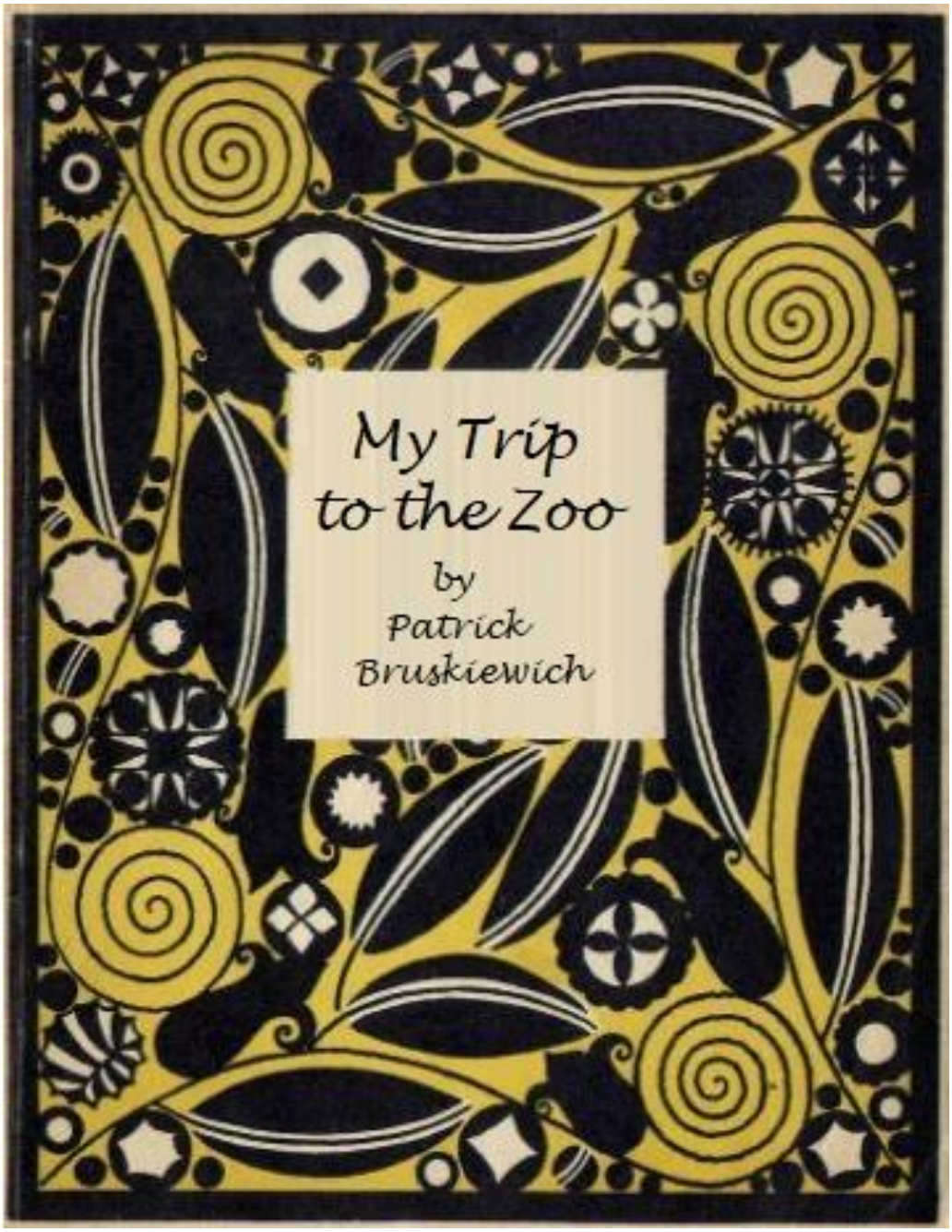
Art Works from the Modern Era

Charis on the Dunes by Edward Weston (1936)





My Trip to the Zoo by Patrick Bruskiewich

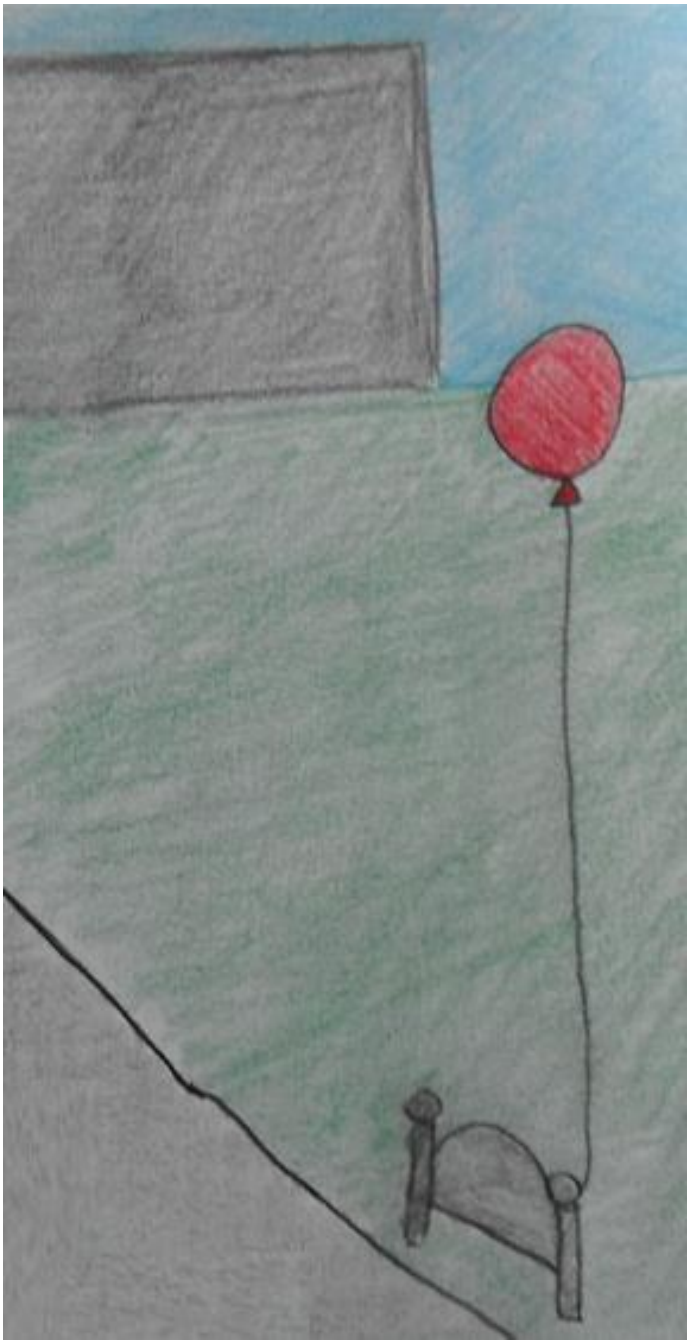


Story words and Crayon drawings by Patrick Bruskiewich

With An Alphabet of Obscure Animals by Katherine Moes

My name is Patrick. I am five years old.

My mother is taking me on a trip to the zoo.

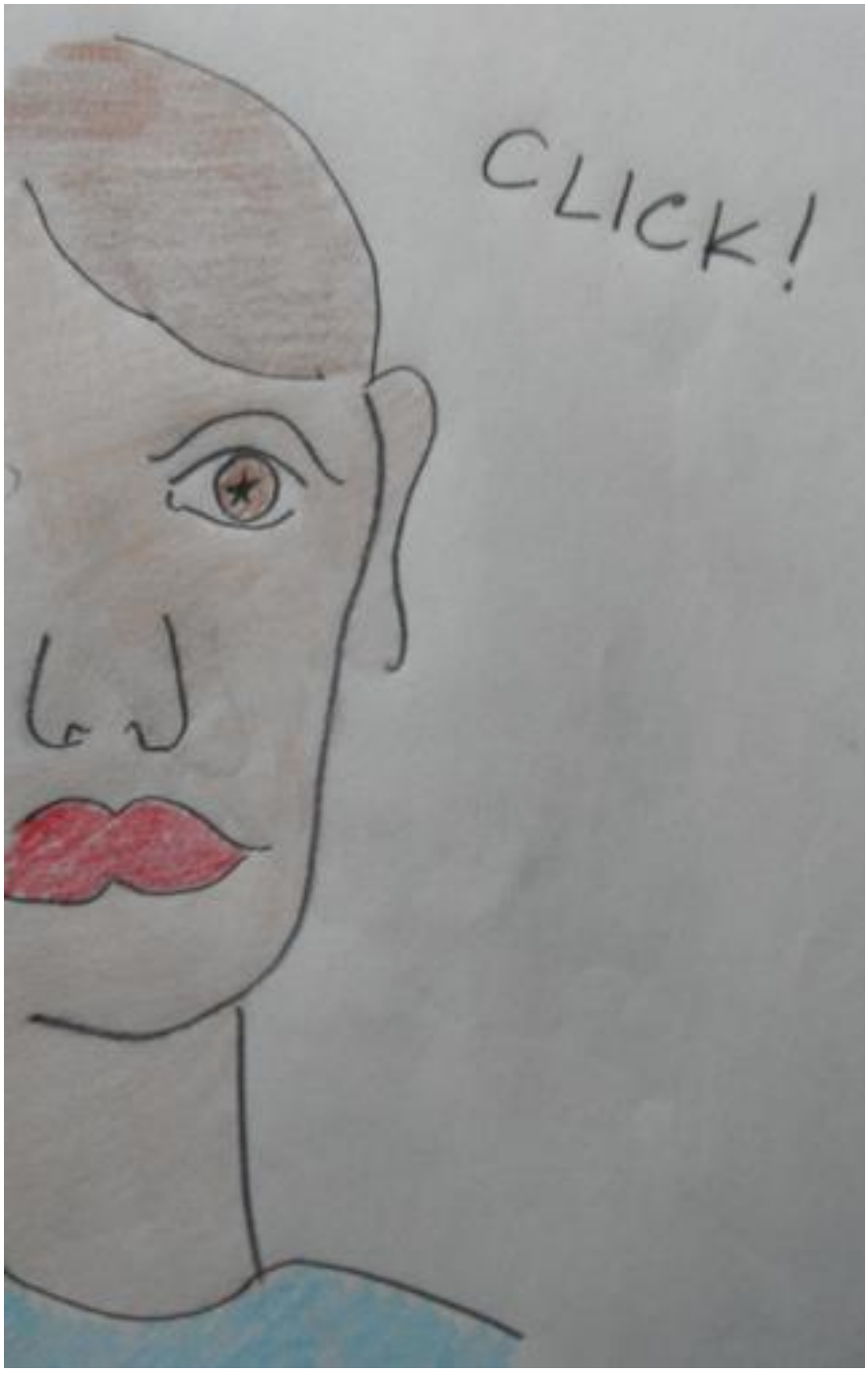


I cannot take my red balloon into the zoo with me.

It scares the animals so I will leave it here.

Hopefully it will still be there when we come back.

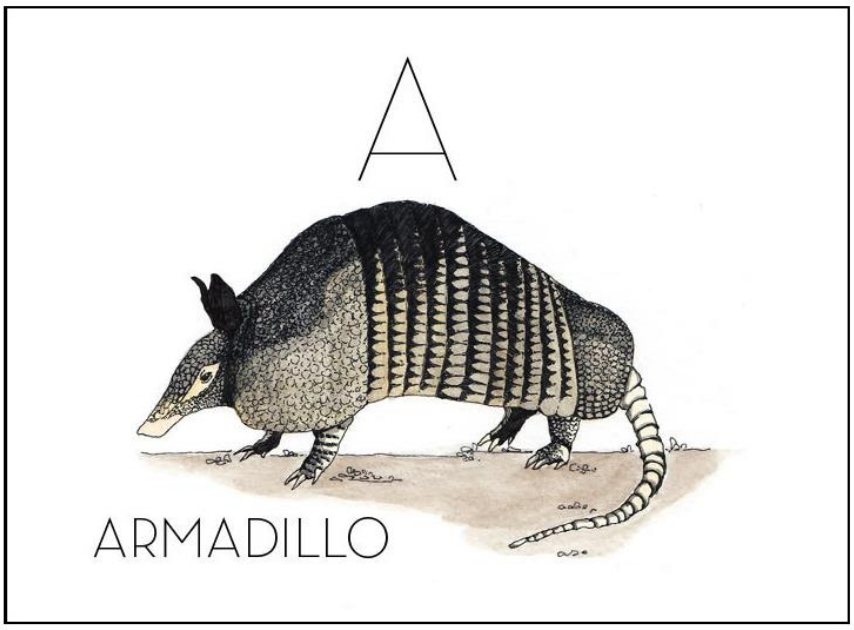
My mother has told me to behave myself,
otherwise the zoo master will think I am a zoo animal
and put me into a cage and feed me bananas.



I have a photographic memory.

Let me share with you the animals in this zoo.

In this zoo animals are arranged in Alphabetical order.

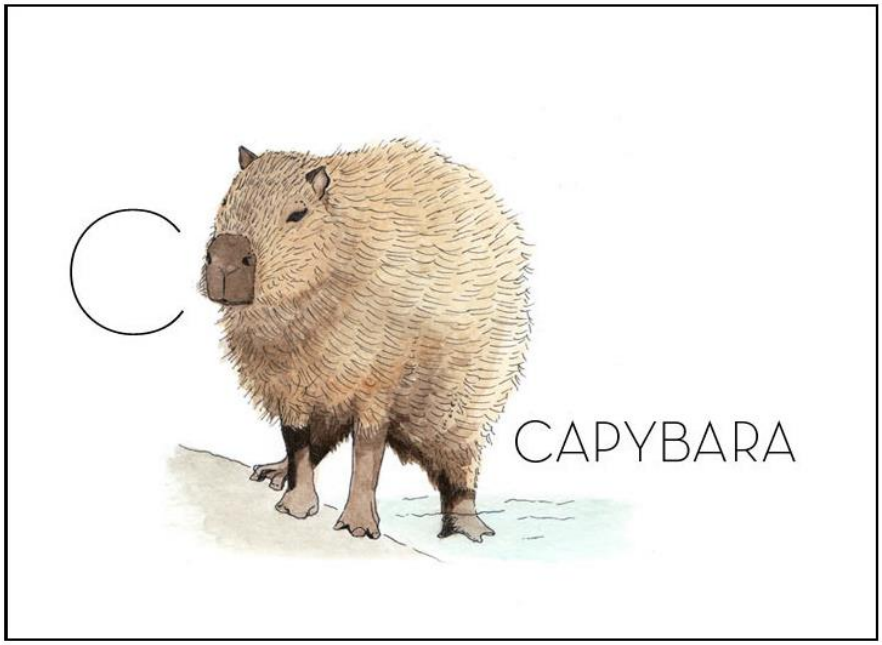


It looks like a small dinosaur but it isn't. It is warm blooded and therefore a mammal. The Armadillo's body temperature is similar to our own. The Armadillo they have on display at the zoo is rather large, as big as Pumpkin our cat at home. Armadillos such as the pink fairy armadillo can be as small as a mouse. Armadillos like to eat insects, ants, worms and grub. They have sharp nails that allow them to dig. Their armor is made of plates of bone. You can find wild Armadillo in the State of Texas in the USA. They like to live alone. Watch out for them in the middle of the road!

The Armadillo at the zoo was named Annabella.

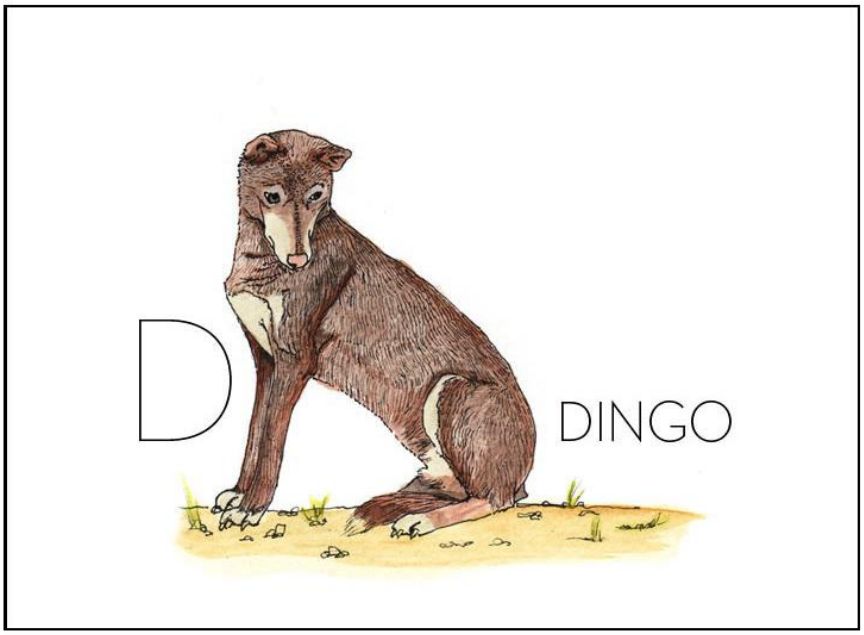
Badgers are short-legged omnivore. An omnivore eats next to anything edible. It could eat plants, animal matter like small mice, insects, worms or grub. Badgers have cousins – the otter, wolverines, minks, weasel and ferrets. They are mammals. They look cute and cuddly, but watch out! Badgers have sharp nails and will scratch, and sharp teeth and will bite. Badgers can be found in Asia, Europe and North America. They live underground in burrows and have a good family life. If you visit them there will be a papa Badger, a mamma Badger and perhaps two babies.

The Badger at the zoo was named Bruno.



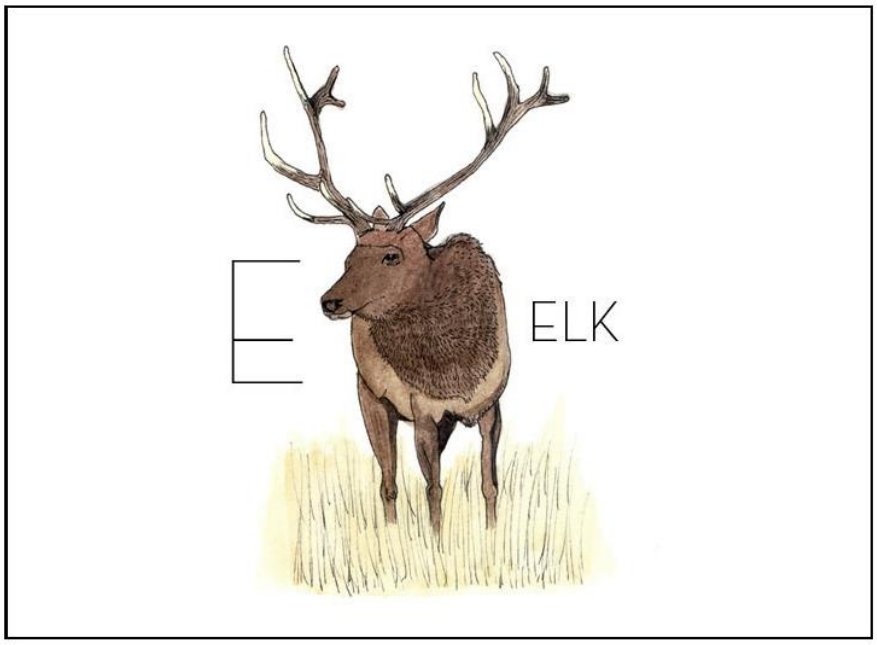
If you don't come from South America then perhaps you have never seen or heard of a Capybara. It is a very gentle creature. It is considered a large rodent, but better behaved than a rodent like a rat. It is related to the guinea pig. Capybara are very social creatures and live in communities of many dozen. They are warm blooded. Capybara eat grass and like to live on savannas, in dense forests and near bodies of water, like streams, creeks and lakes. The Capybara at the zoo is as big as my cat.

The Capybara at the zoo was named Charles.



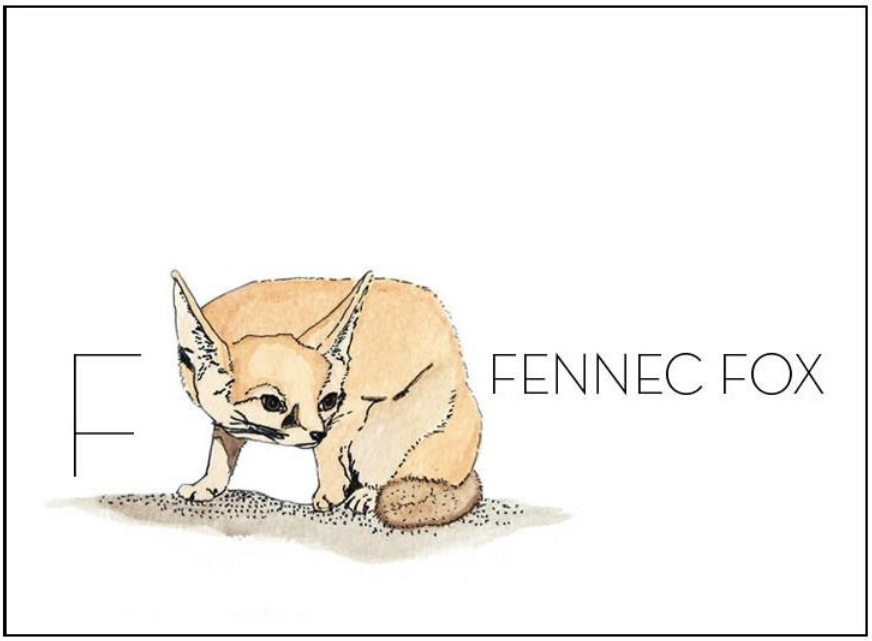
A Dingo is a wild dog from down under – from Australia. They roam the arid outback. Dingos are omnivores and will eat anything but they prefer to eat small animals rather than plants and insects. Dingos will go after cattle and sheep. They live in groups. During the day they growl and bark to communicate. At night howl. When you approach a dingo be careful, otherwise it may want to chase you.

The Dingo at the zoo was named Dexter.



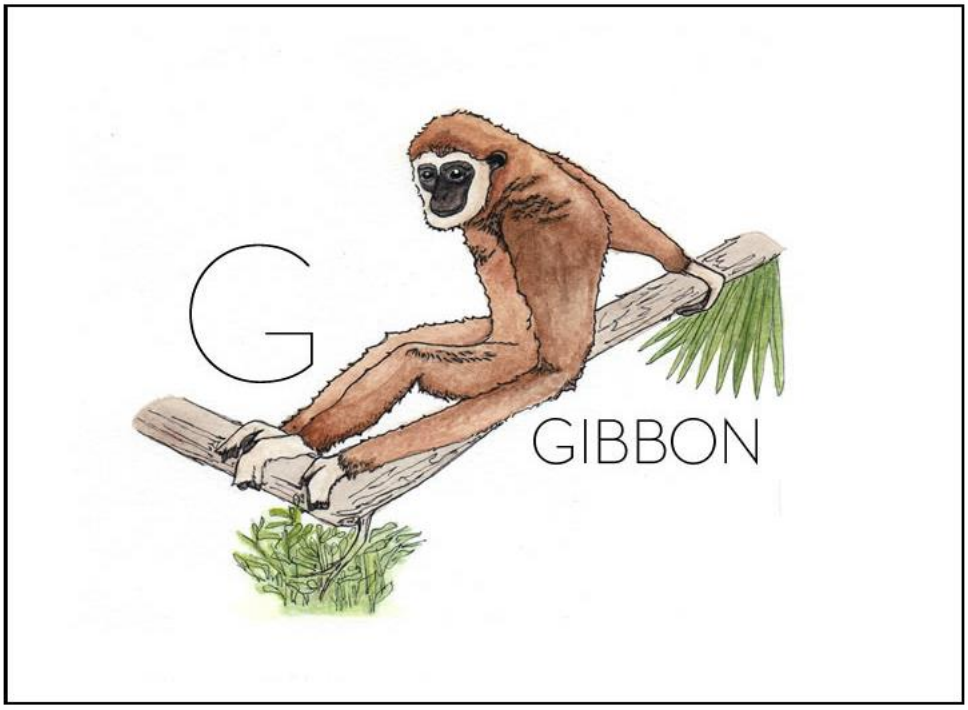
An Elk is a member of the deer family. They are mammals and roam throughout the northern reaches of North America, central and East Asia. Male Elk have large antlers which they use to fight other males with their antler to establish their dominance over other males and as a way of attracting female Elk. When they do this, this is known as rutting. Rutting occurs in the spring time. A male Elk can weight over half a metric ton so be careful if you see one. Don't get too close or he will chase you and try to poke you with his antlers.

The Elk at the zoo was named Estella.



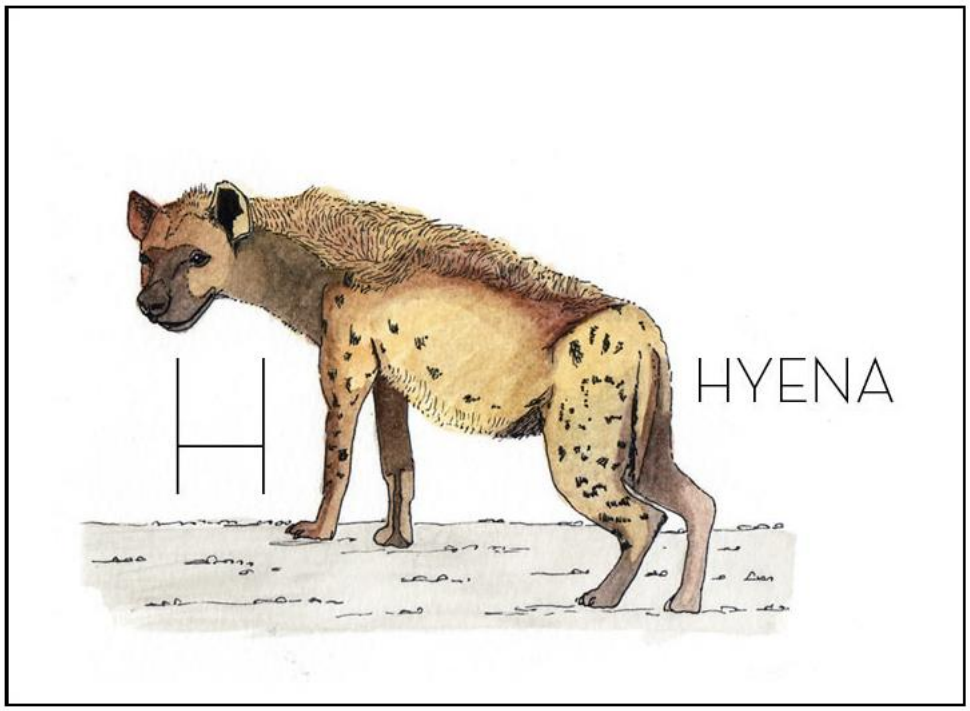
A Fennec Fox has big ears. They can be found in deserts. They are crepuscular creatures (I had to ask my mother what that meant) which means they like to come out at day break or just as the sun goes down to hunt for food. They are mammals and live in small family groups. They are omnivores and like to eat insects, small mammals and birds. Their big ears help them to find food and also protects them from predators. A Fennec Fox makes for interesting exotic pets.

The Fennec Fox at the zoo was named Farnsworth.



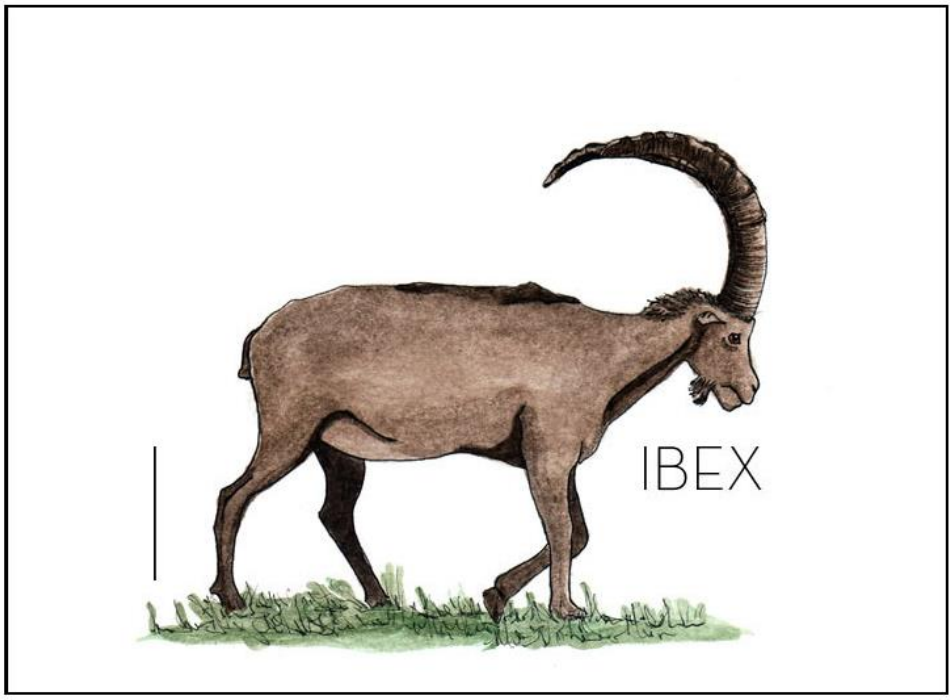
Gibbons are known as lesser apes. They are primates but their bodies are smaller than gorillas or chimpanzees. They live in tropical rain forests in East and West Asia. They are mammals and live in large family groups. When they walk they carry their hands at shoulder height to balance themselves. It is quite comic to watch them walk. They are very smart and enjoy playing. Gibbons like to mate for life.

The Gibbon at the zoo was named George



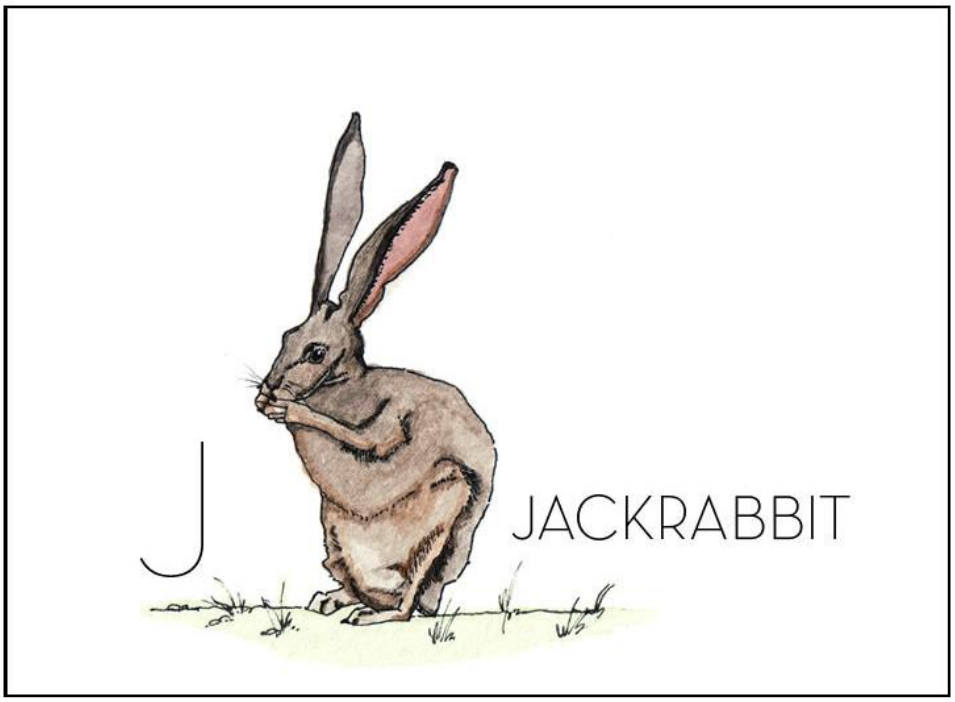
Ha ha ha! I like to laugh at the hyenas, because they like to laugh at me. You might think that hyena are dogs but they aren't. They do live together in packs and they catch their prey with their teeth. Hyenas are considered scary creatures by many cultures. They mostly live in Africa. Hyenas are thought to influence people's spirits, rob graves, and steal livestock and even eat children. But this is just myth!

The Hyena at the zoo is named Henry.



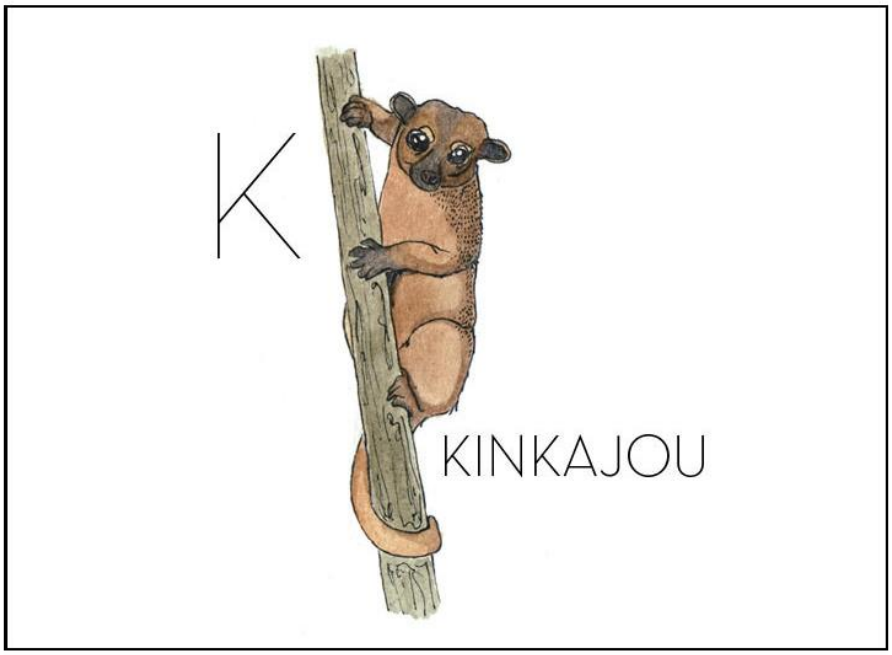
Ibex are a form of wild goat. Male ibex have large horns that curve backwards (boy they must have a sore neck). Like goats, a male Ibex is known as a buck, a female Ibex is known as a doe and their children are known as kids. It is a bit of a surprise to hear that does have horns too, but they are much smaller than the male horns. Ibex can be found in Europe, the Middle East and parts of Asia.

The Ibex at the zoo is named Isabella.



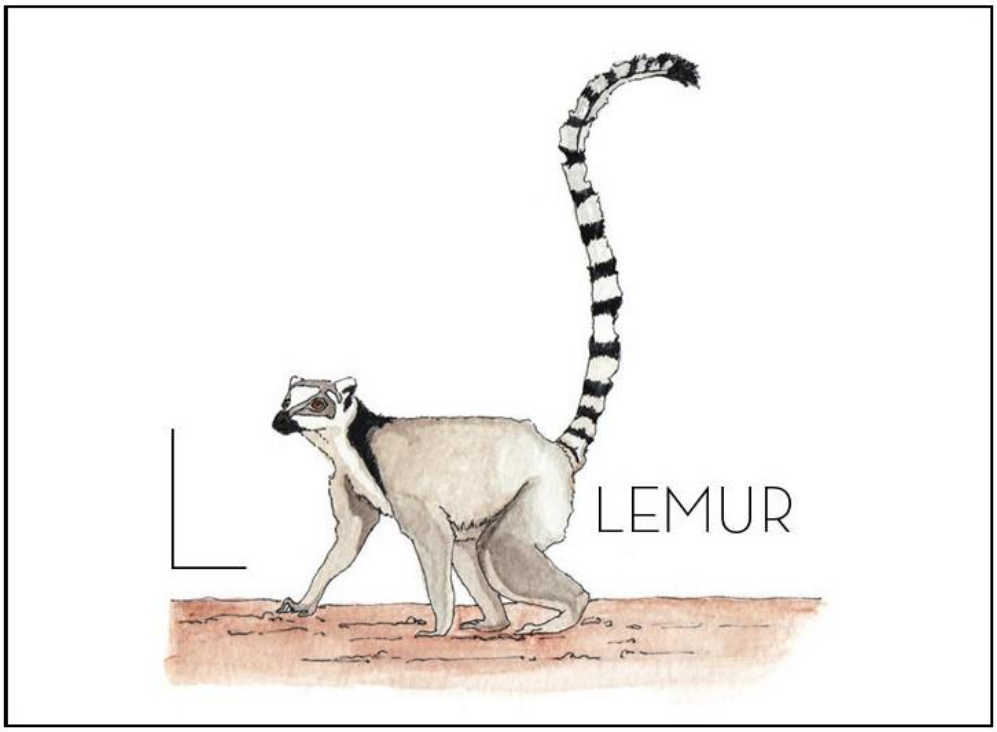
I think Jackrabbits are so funny. They jump about. They have long floppy ears which help to keep them cool. They have funny noses that twitch back and forth. They are herbivores animal who only eat plants. My aunt sometimes says to me ‘what don’t you become a vegetarian like a rabbit?’ My most favorite Jackrabbit is Bugs Bunny. He hops fast enough and out thinks the characters trying to catch him.

The Jackrabbit at the zoo is named Bugs.



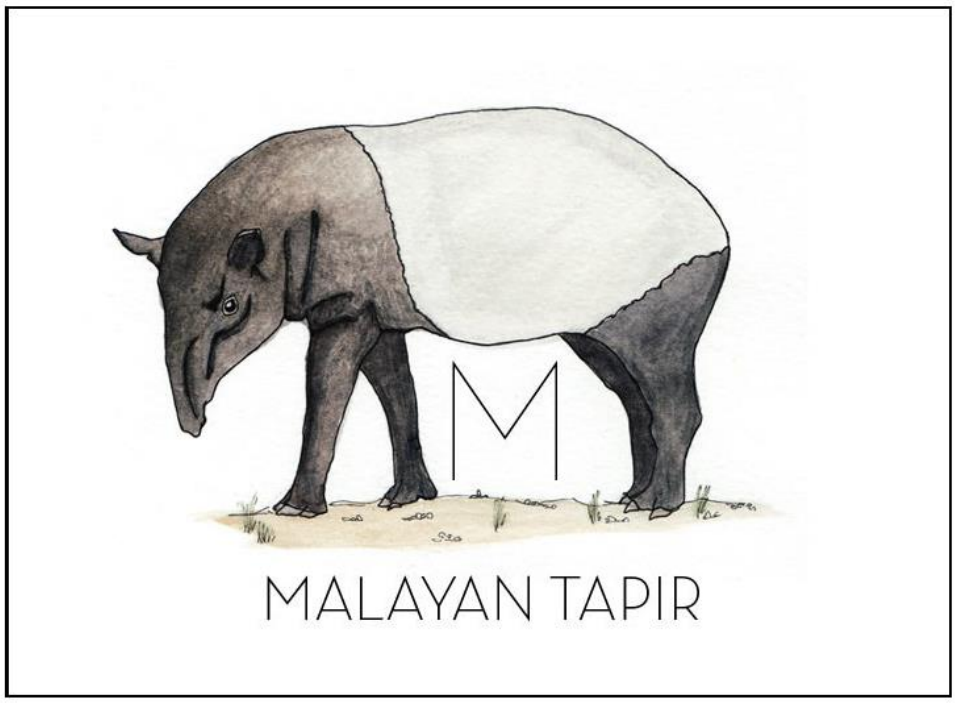
A Kinkajou is a funny little creature with a small head, hands that like to grasp onto things and a very long tail that it uses to jump from one tree to another. Kinkajous live up in the trees in tropical rain forests in Central and South America. They are mammals and have short brown hair. They are omnivores but they mostly like eating flowers and fruit. In the dusk or dawn light their eyes appear green or yellow.

The Kinkajou at the zoo is called Katherine.



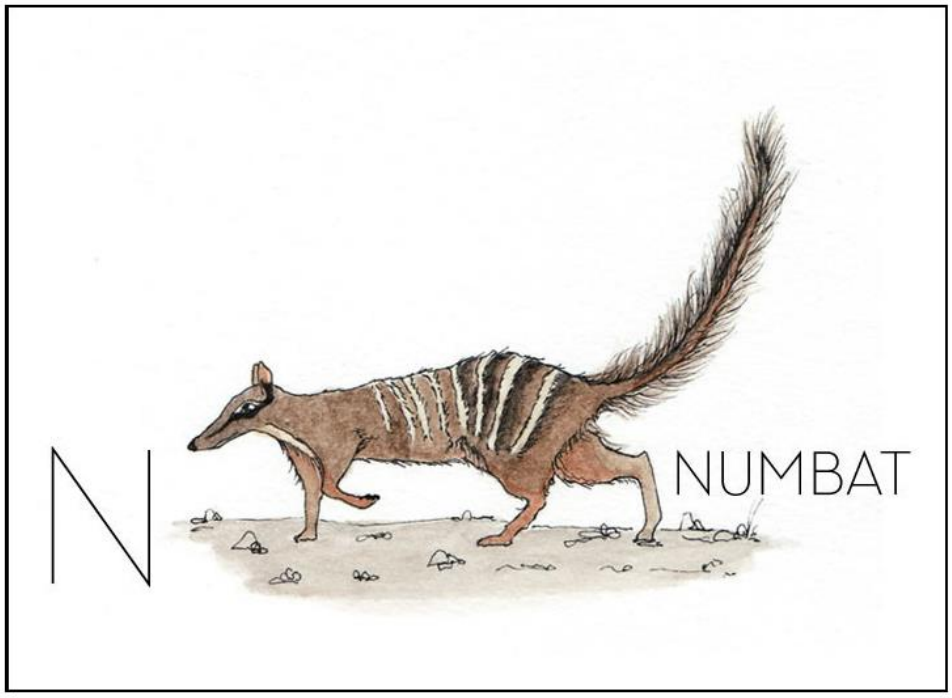
Lemurs are small mammals with a pointed snout, large eyes, and a long tail. They live up in the canopy of trees and are active mostly at night. Lemurs are only native to the island of Madagascar. There are one hundred different types of Lemurs that live on Madagascar. The females run the Lemur society. Lemurs are vegetarians.

The Lemur at the zoo is called Lucille.



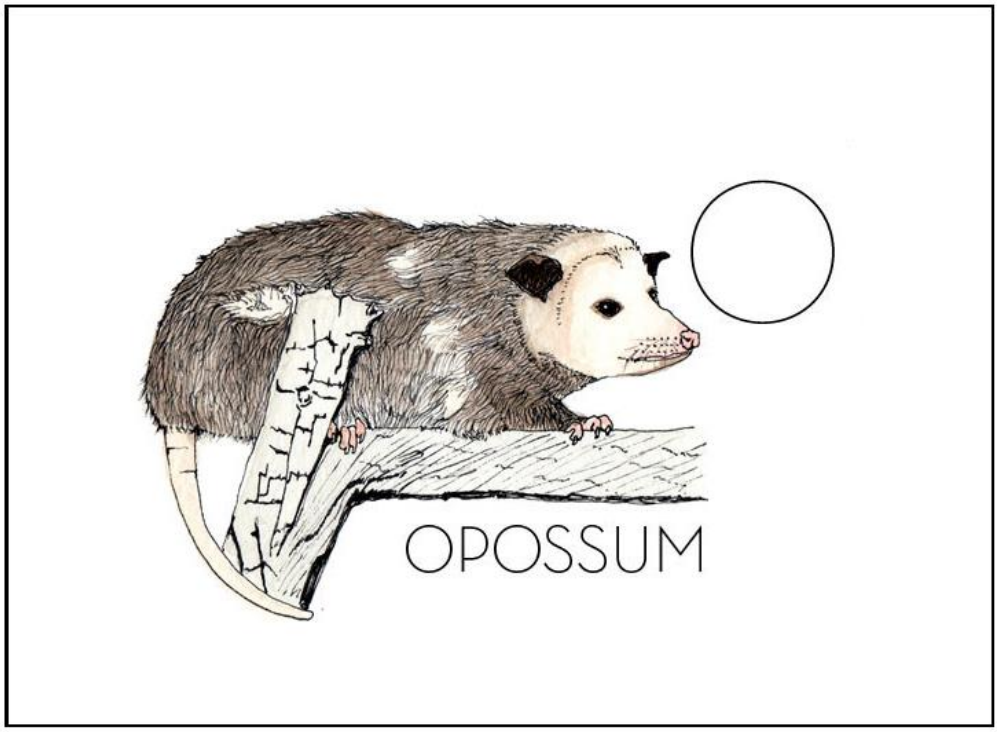
The Malayan Tapir is a very rare animal. Only a few thousand still exist in the wild. They have very poor eyesight and rely mostly on hearing and smell. Tapirs mark out their territories by peeing on the plants. They are large and timid creatures with few natural predators. They like eating leaves, shrubs and fruit. They really love eating bananas. A Tapir's nose is called a proboscis. They make for interesting pets!

The Malayan Tapir at the zoo is called Theodore.



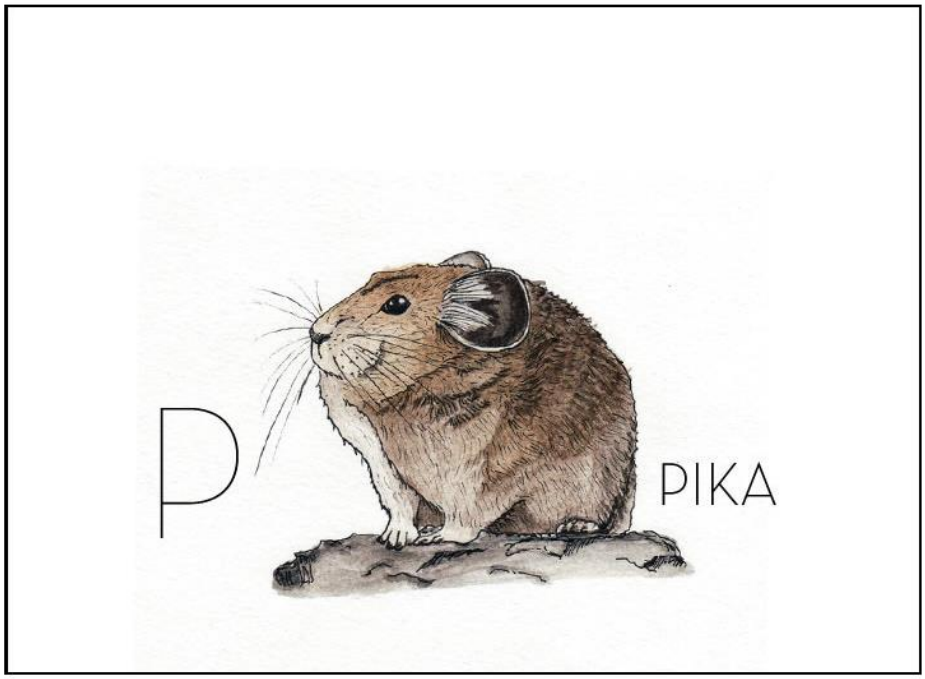
Numbats are a very rare creature. They are marsupials (a special class of mammals) that are only found in the south of Australia. Other marsupials include the Opossum, the Tasmanian Devil, Kangaroos, Koalas and Wombats. There are over 300 different types of Numbats. Numbat enjoy eating insects making them insectivorous. The way that marsupials make and make their babies is very unique – so my mother says – but that's all she will tell me. I guess that will have to wait until I am older.

The Numbat at the zoo is named Norman.



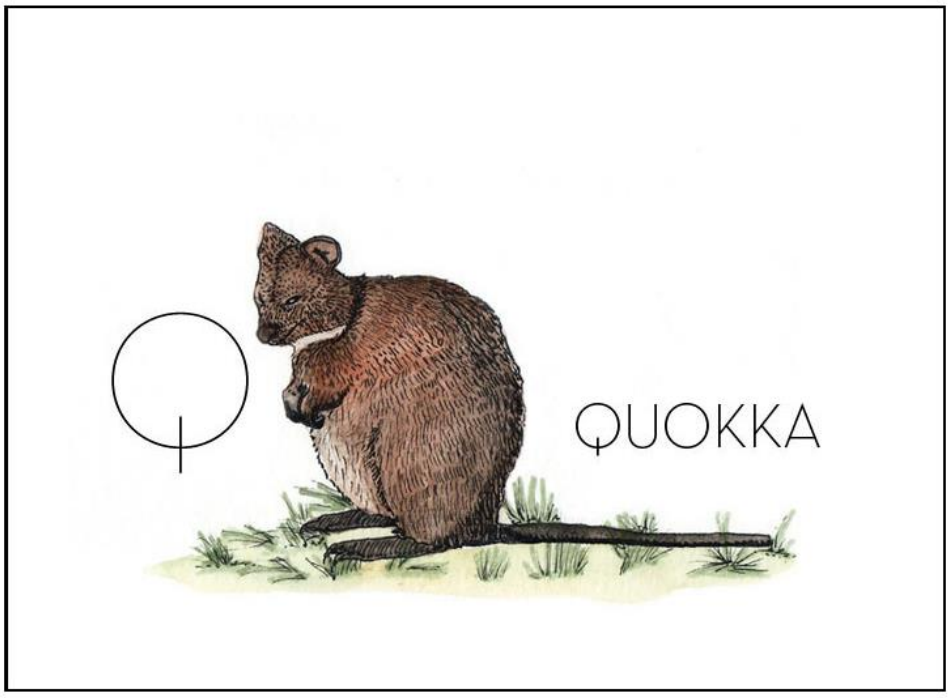
Opossums are North and South American marsupials. Opossums will eat dead animals, insects, rodents and birds. They also feed on eggs, frogs, plants, fruits and grain. If you leave your dog or cat food out, they will eat that too. A mama Opossum will carry all her kids on her back when they move about (sometimes as many as eight). Opossoms are known to feign death if they are frightened. They will also hiss at you if they are angry. Opossum like to hang by their tails from a tree branch.

The Opossum at the zoo is called Oliver.



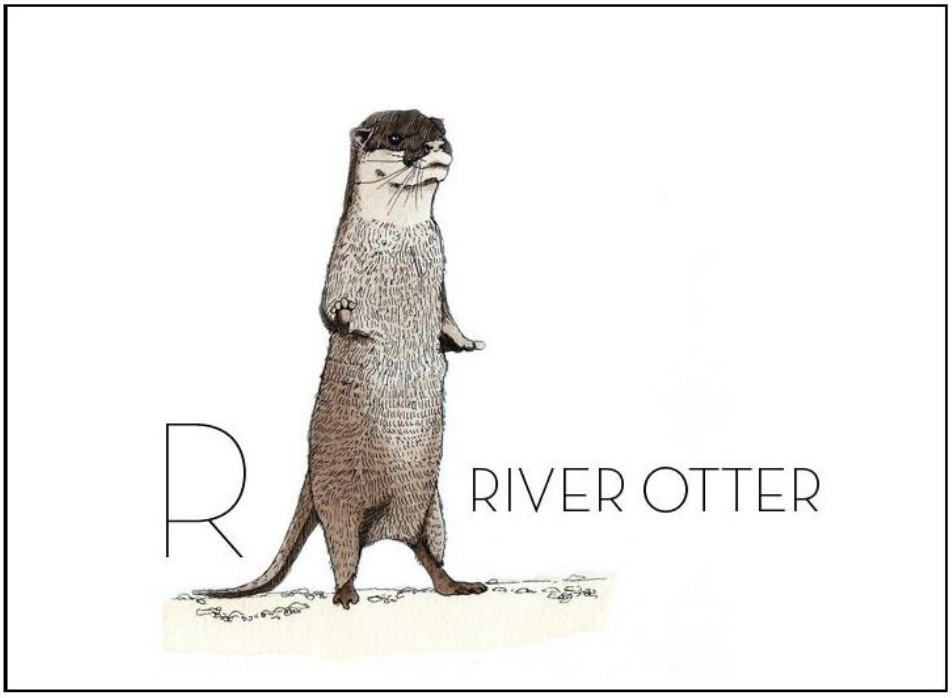
Pikas live high up in the mountains. If you think they are mice, let me tell you they don't have tails. They are mammals but they aren't mice. They live in burrows and they are herbivores. Pikas are in fact related to rabbits and hare, except they have small ears. They live in cold climates in Asia and North America. We can't keep Pikas as pets. Pikas require cold temperatures to live, and can die of heat exhaustion if exposed to temperatures above 25.5°C for long periods of time.

The Pika at the zoo is called Peter.



A Quokka is a marsupial from Australia. It is about the size of my cat Pumpkin and is similar to a wallaby. If you haven't guessed yet the Zoo Master is from Australia and he has brought in animals that remind him of his home. The Quokka babies are known as joeys and a mother Quokka over her lifetime will birth as many as sixteen joeys (I asked my mother whether I could have fifteen brothers and sisters and she changed the subject). Quokka sleep during the day and go about after dark. They are nocturnal. They are vegetarians. They love to smile.

The Quokka at the zoo is called Qwynn.

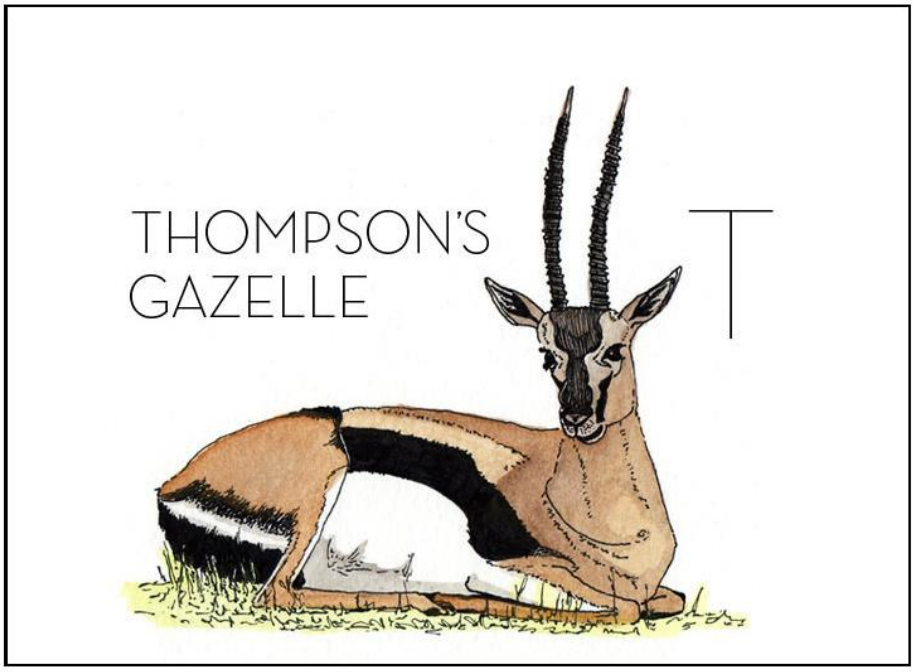


River Otters are very playful creatures. They are mammals who spend much of their time in water. They swim and play and chase after fish and crustaceans. They are not shy. They will come up to you and hope you will play with them. Even though they are cute they have sharp nails and sharp teeth and like to bite. So stay away. They live in dens close to the water's edge so that they can jump into the water.

The River Otter at the zoo is called Reginald.

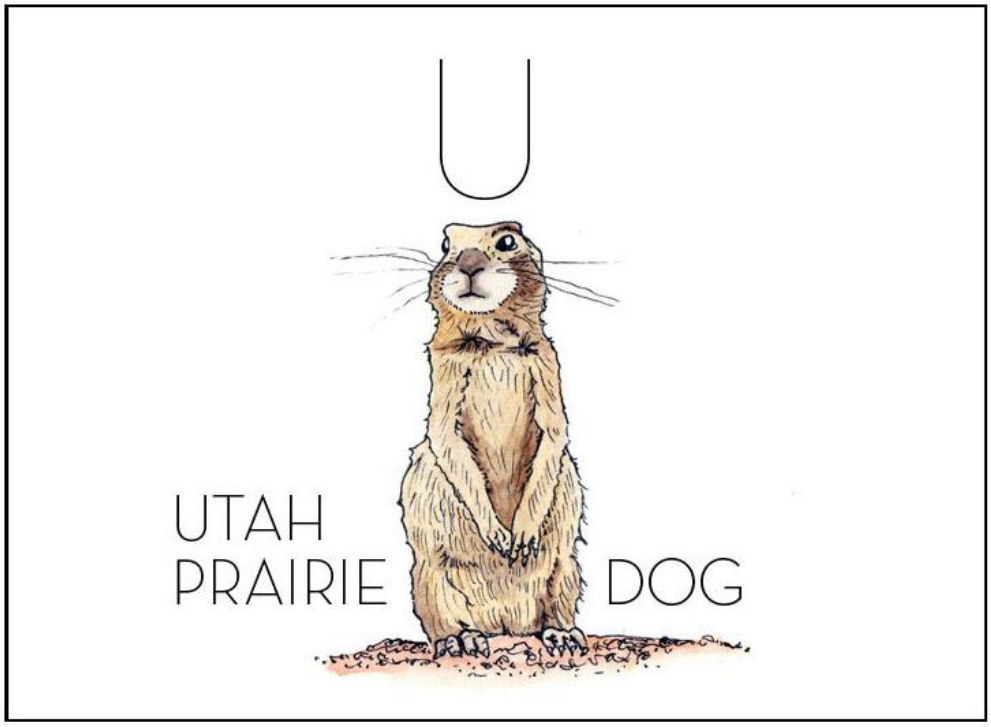
The Sand Cat is a wild feline that lives in rocky and sandy deserts. Their fur mimic the colors of their surroundings. They have big faces and ears. The Sand Cat can be found in deserts across North Africa and the Middle East. They are very small cats with tails almost as long as their bodies. The Sand Cat are carnivores that chase after rodents and hares. They sometimes also eat small birds or their eggs.

The Sand Cat at the zoo is named Seymour.



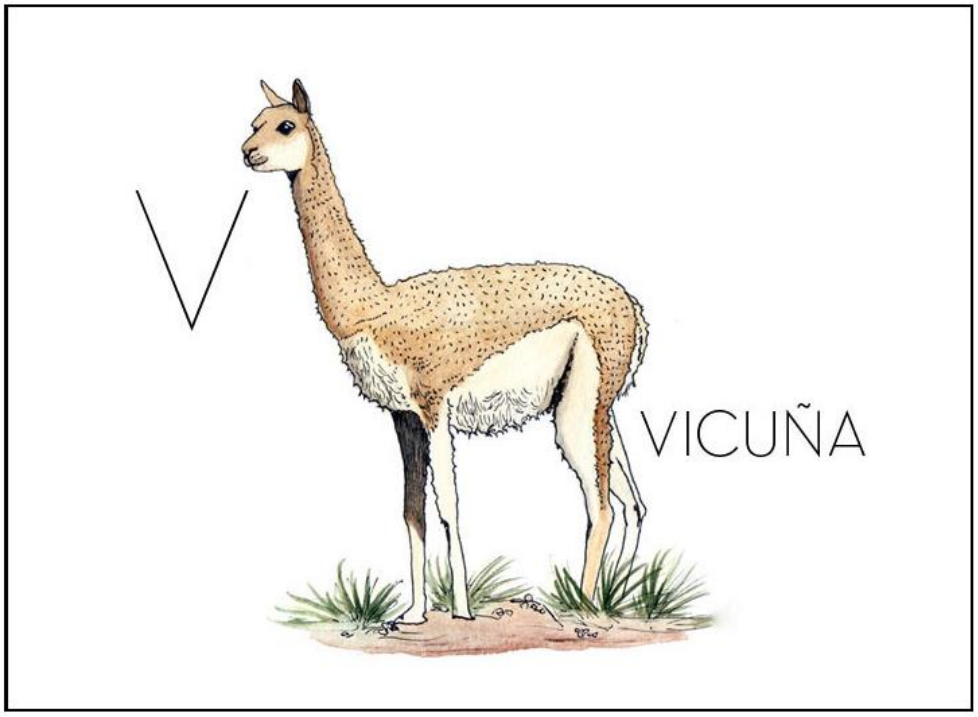
The Thompson Gazelle is a red-fronted gazelle that is found in great numbers in Africa. Europeans sometimes call the gazelle a "Tommie," after the 19th century English explorer that named this gazelle. Gazelles can run fast and jump high. Tommies can run as fast as 90 kmh and leap higher than they are long. This proves useful when being chased by a predator. The Thompson Gazelle is the fourth fastest mammal on planet Earth. Boy do they like to run, sometimes just for fun!

The Thompson Gazelle at the zoo is called Gabriella.



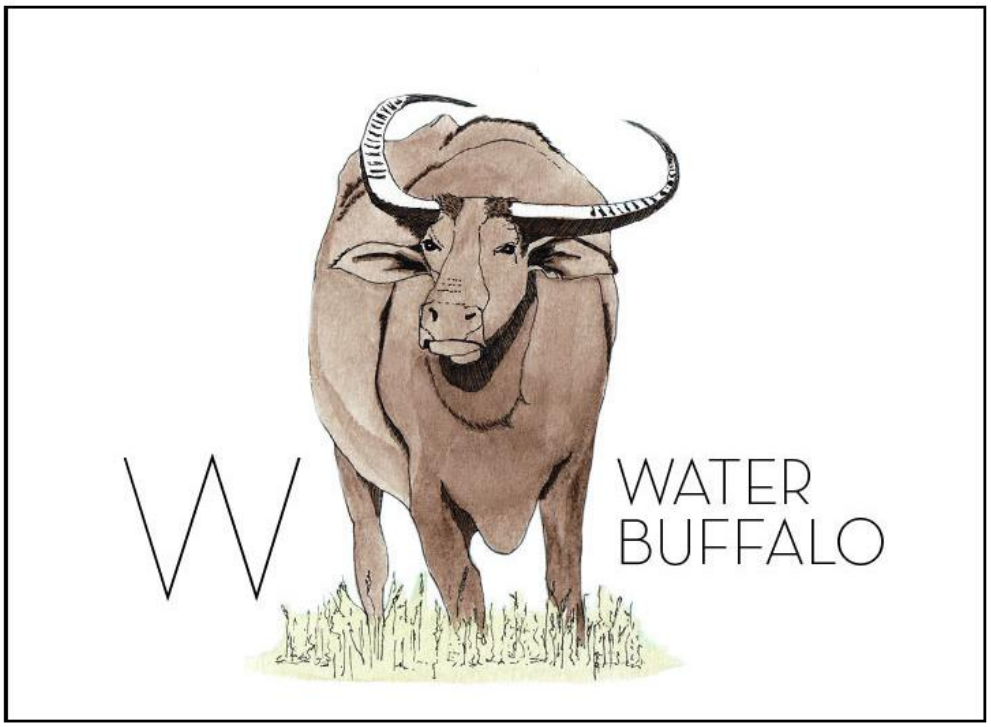
The Utah Prairie Dog is the smallest of the prairie dogs. They are related to squirrels and rodents. They live on the rolling grasslands of the prairies. They are herbivores and eat grass and other vegetation. They sometimes also eat cicadas. The Utah Prairie Dog live in little burrows that stick up out of the ground like little dirt mountains. They are communal and like to build their burrows in small towns. They whistle and click to communicate. It likes to stand on its hind legs to look around.

The Utah Prairie Dog at the zoo is called Pete.



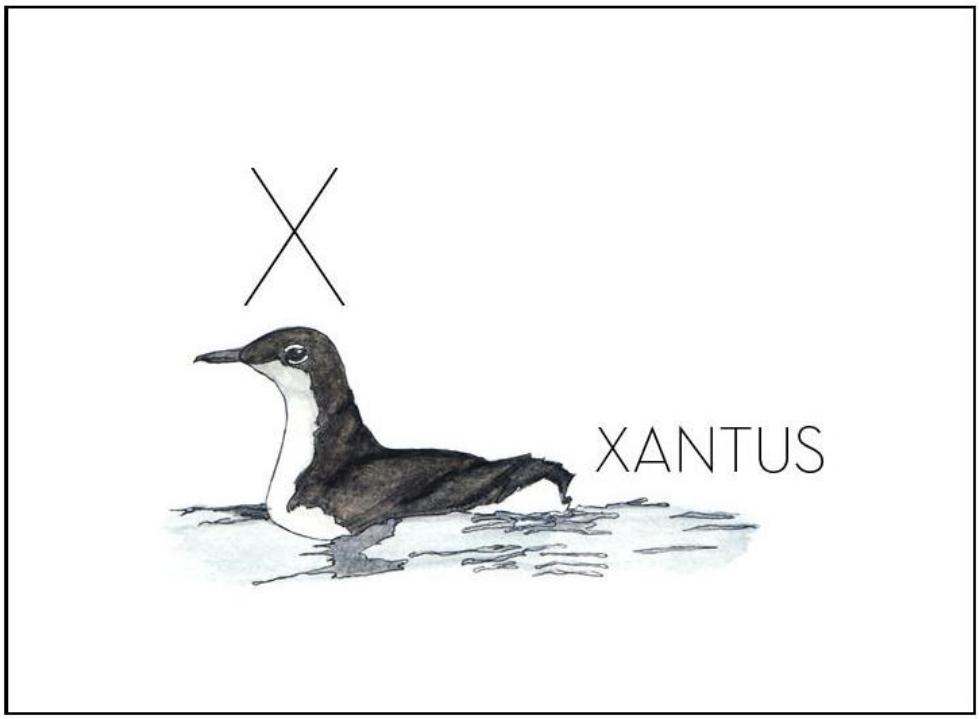
The Vicuna is a very unique animal. It is a small South American camel or camelid. It can be found in the high alpine areas of the Andes. Like sheep they can provide wool. The Vicuna's coat can be made into a soft wool. Forty years ago there were only a few thousand Vicunas. Today because of conservation efforts there are now more than 350,000. They are quite large animals sometimes measuring 175 cm long.

The Vicuna at the zoo is called Victoria.



The Water Buffalo is a large bovid that loves to stand in water. Bovids include cows, antelopes and other mammals with hooves. A fully grown Water Buffalo can weigh half a metric ton. There are over 100 million Water Buffalos in the Far East. Most are found on farms as domesticated animals. They can be used to till rice fields. The female produce milk which is used to make yoghurt and other culinary delights.

The Water Buffalo at the zoo is named Bentley.

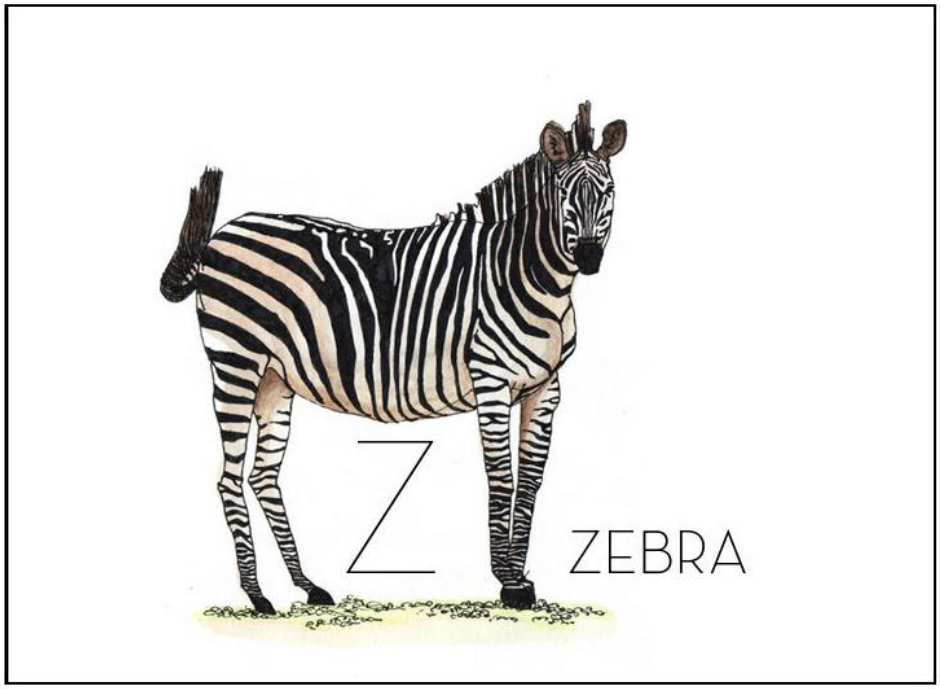


The Xantus is a hummingbird. It mostly lives in Baja in California. Typically it is under ten cm long and weighs less than 5 gm. Like most hummingbirds it can hover and fly at great speed. At the zoo I watched as a dozen different Xantus fly here there and everywhere. It was fun to watch them hover. Did you know a hummingbird's heart can beat over 1000 times in a minute! They have a high metabolism and so they have to constantly look for food. They like flowers with nectar and the sun too. I wish I could have a Xantus as a friend.

The Xantus at the zoo is called Xandria.

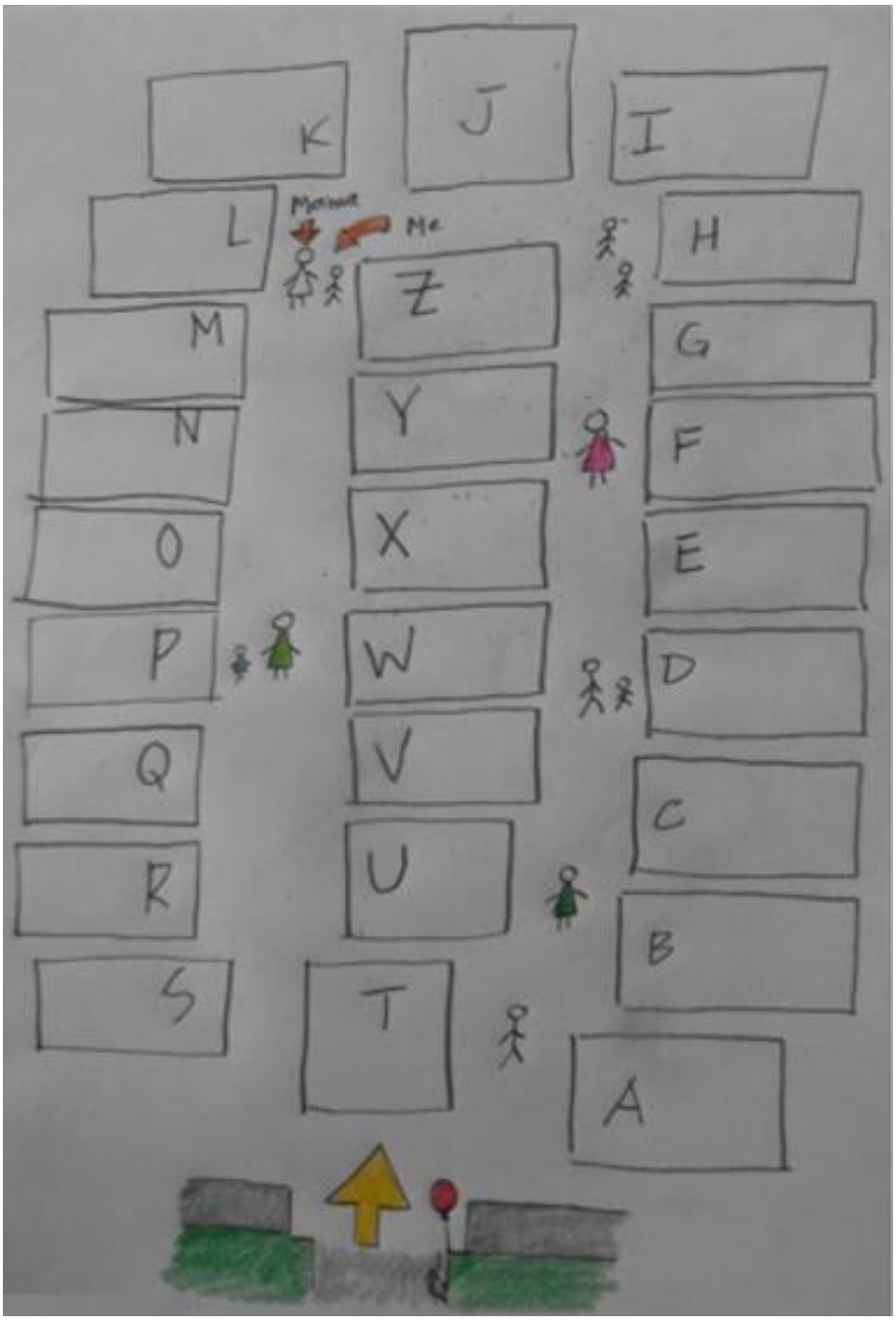
The Yellow Bellied Marmot is also known as a rock chuck. It is a form of ground squirrel. It runs fast and chirps when it is excited. It likes to stand on its hind legs to look around. They live in burrows with as many of two dozen in a community with a dominant male in charge. The Yellow Bellied Marmot are diurnal and omnivores feeding on plant material, insects, and bird eggs. You only see them in the summer for they hibernate for most of the year starting in September and lasting through the winter. *How much rock could a rock chuck chuck if a rock chuck could chuck rock. As much rock as a rock chuck could, if a rock chuck could chuck rock!*

The Yellow Bellied Marmot at the zoo is called Martin.



You can't have a zoo without a Zebra. How you pronounce Zebra depends on whether you are American or English. Zee of Zed? I am Canadian so I pronounce it Ze(d)bra … Zebra are from the equine family that includes horses, donkeys and Zebra. They inhabit Eastern and Southern Africa. They are found in grasslands and savannas, shrub lands, woodlands and at the bottom of many mountains. Zebra are herbivores. They travel in groups that are sometimes called Harems … now that's an adult term I had to ask my mother to explain. The baby Zebra are called foals.

The Zebra at the zoo is called Zachariah.



Can you remember the different animals and their zoo names?

New Poems by Contemporary Poets

Two New Poems by Aki Kurosawa

Only if we Don't Play the Chase

Girls think that boys have more fun
Boys say that girls do …
So what of these two plays
are in fact true?

Boys do chase after girls
But girls are not to chase after boys!
So boys have more fun? Well, perhaps
It depends on whether you like the chase?

Boys don't need to 'be careful' do they?
But girls have to be, don't we?
Otherwise the fun is over …
Girls with big pregnant bellies
Are not chased after and can't run
fast enough to catch up
with the fathers of their babies.
Can they? The fathers keep on running …
Honestly I think that girls
have more fun … don't we?
But only if we don't
Play the chase …

If They are the Right Fit

When I meet a boy
For the first time
I like to ask them
What interests you?

If they say money
I take them shopping
After the third date
They leave me … Why?
They don't want to spend
their money on me!

If they say sports …
I take them to watch
A baseball game
And then I sneak away.
They never notice I am gone.

If they say they like films …
We usually watch the French
New Wave … each film
I know by heart. They don't
What about Truffault? Ummm …

So much for film!

If they say they are into video games
I know they have yet to grow up.
Otaku imasu … their mothers still
Look after them. No thanks!
No mothering from me please.

If they are into art then out
Comes my sketch book and
Pencils. '*Will you sit for me?*'
I ask them. Some do, most don't
If they do I size them up …

If they are the right fit … not
too big … or only into themselves
mind you … only then do I let
them ask '*Can I draw you too*?'
I like this play …
As they size me up too.

The Crack of Lightening

The crack of lightening
The roar of thunder
It shakes me to the quick!

I am scared I always am
When the sky flashes
And Zeus lets loose!

A storm is one of my earliest remembrances
That and the warm
Embrace of my dear mother
As she wrapped her arms around me
And sang a French song

Frere Jacques, Frere Jacques
Dormer vous, Dormer Vous …

And so I slept out the storm.

Today the crack of lightening
The roar of thunder
I close my eyes and can hear her voice

Even though she is in heaven
her song comes from high

Zeus away with you
I want to hear my mother's voice!

Poetry of the Mundane

Mercedes Benz
Lamborghini
Audi
BMW

Gucci
Versace
Coco
Louis Vitton

Champagne
Vodka
Red, white
or rose

Hawaii
Monacco

Puerto Vallata

Cuba

Oh how ordinary …

The Bridges to Our Lives

There are three bridges to our lives

The bridge that brings us to our birth
The bridge that is our growing up
And the bridge to our eventual demise.

Just as there are three bridges
That God can send us over
Depending on who we are

and what we do with our lives

There is a that long bridge to Hell,
which is always crowded

There is a that rickety bridge to Purgatory,
which is perhaps one way

and then there is that bridge to Heaven
which is rarely ever jam-packed

There is Little of My Soul Left

Dear God,
Forgive me
For I have sinned.

I have loved
in a world filled
full of hate.

I have been gentle
when others really
only want to be mean.

I have tried to create
Heaven on Earth
but it is hell they really want.

I have tried to be kind and strong
but I have been ground
to dust instead.

Dear God,
Forgive me
For I have sinned.

There is little of my soul left
here crushed beneath my cross
and crown of thorns.

A Few Words …

When I am in the mood
I sit and write poetry.

Usually it is
when I am nostalgic
or happy about life
or when I feel romantic
or when I feel troubled.

Then I share
A few words …

Here are some for you!

Are our Lives an Oxymoron?

It's our *only choice*
for sure …
an *open secret* that
each day we must
trudge, trudge, trudge
off to work!

Is this the meaning of our lives?
Isn't it forty two?
But what is the question?

Isn't it … why we trudge
to work. Here's a clue
forty-two in binary is
I O I O I O …

It's off to work we go.

OMG …
Such *deafening silence*!
Are our lives an oxymoron?
… are we *the living dead*?

There are Minotaur amongst us

Come save us … Salvador
As we dili and dali
The world has once again
become Monsterous …

Brothers kill brothers, and sisters too,
and little babes as they wait for their choo choos
to take them to safe haven.

Little angels unknowing
what sins abound about them
who get their wings far … far … far
too early as we bury them
In their loving mother's arms

The world is once again
DaDa … so horrific
So surreal!

There are Minotaur amongst us
we better all run and hide
before they eat us all alive!

Heh …Throw us a few Coins!

Almost everyone loves poetry
But darned if they'll recompense
The poet for their toil

Almost everyone has their favorite
Poet, perhaps even one who still lives
Who they walk past in the street

Not noticing their begging bowl
Not recognizing their dignity
Nor their poverty!

It is not that the poet
Will turn away your generosity
It's just …just .. its

that you just ain't generous
to begin with

Heh … throw us a few coins!

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Prose from the Past

Under the Pyramids by H. P. Lovecraft for Harry Houdini

Mystery attracts mystery. Ever since the wide appearance of my name as a performer of unexplained feats, I have encountered strange narratives and events which my calling has led people to link with my interests and activities. Some of these have been trivial and irrelevant, some deeply dramatic and absorbing, some productive of weird and perilous experiences, and some involving me in extensive scientific and historical research. Many of these matters I have told and shall continue to tell freely; but there is one of which I speak with great reluctance, and which I am now relating only after a session of grilling persuasion from the publishers of this magazine, who had heard vague rumours of it from other members of my family.

The hitherto guarded subject pertains to my non-professional visit to Egypt fourteen years ago, and has been avoided by me for several reasons. For one thing, I am averse to exploiting certain unmistakably actual facts and conditions obviously unknown to the myriad tourists who throng about the pyramids and apparently secreted with much diligence by the authorities at Cairo, who cannot be wholly ignorant of them. For another thing, I dislike to recount an incident in which my own fantastic imagination must have played so great a part. What I saw—or thought I saw—certainly did not take place; but is rather to be viewed as a result of my then recent readings in Egyptology, and of the speculations anent this theme which my environment naturally prompted. These imaginative stimuli, magnified by the excitement of an actual event terrible enough in itself, undoubtedly gave rise to the culminating horror of that grotesque night so long past.

In January, 1910, I had finished a professional engagement in England and signed a contract for a tour of Australian theatres. A liberal time being allowed for the trip, I determined to make the most of it in the sort of travel which chiefly interests me; so accompanied by my wife I drifted pleasantly down the Continent and embarked at Marseilles on the P. & O. Steamer *Malwa,* bound for Port Said. From that point I proposed to visit the principal historical localities of lower Egypt before leaving finally for Australia.

The voyage was an agreeable one, and enlivened by many of the amusing incidents which befall a magical performer apart from his work. I had intended, for the sake of quiet travel, to keep my name a secret; but was goaded into betraying myself by a fellow-magician whose anxiety to astound the passengers with ordinary tricks tempted me to duplicate and exceed his feats in a manner quite destructive of my incognito. I mention this because of its ultimate effect—an effect I should have foreseen before unmasking to a shipload of tourists about to scatter throughout the Nile Valley. What it did was to herald my identity wherever I subsequently went, and deprive my wife and me of all the placid inconspicuousness we had sought. Travelling to seek curiosities, I was often forced to stand inspection as a sort of curiosity myself!

We had come to Egypt in search of the picturesque and the mystically impressive, but found little enough when the ship edged up to Port Said and discharged its passengers in small boats. Low dunes of sand, bobbing buoys in shallow water, and a drearily European small town with nothing of interest save the great De Lesseps statue, made us anxious to get on to something more

worth our while. After some discussion we decided to proceed at once to Cairo and the Pyramids, later going to Alexandria for the Australian boat and for whatever Greco-Roman sights that ancient metropolis might present.

The railway journey was tolerable enough, and consumed only four hours and a half. We saw much of the Suez Canal, whose route we followed as far as Ismailiya, and later had a taste of Old Egypt in our glimpse of the restored fresh-water canal of the Middle Empire. Then at last we saw Cairo glimmering through the growing dusk; a twinkling constellation which became a blaze as we halted at the great Gare Centrale.

But once more disappointment awaited us, for all that we beheld was European save the costumes and the crowds. A prosaic subway led to a square teeming with carriages, taxicabs, and trolley-cars, and gorgeous with electric lights shining on tall buildings; whilst the very theatre where I was vainly requested to play, and which I later attended as a spectator, had recently been renamed the "American Cosmograph". We stopped at Shepherd's Hotel, reached in a taxi that sped along broad, smartly built-up streets; and amidst the perfect service of its restaurant, elevators, and generally Anglo-American luxuries the mysterious East and immemorial past seemed very far away.

The next day, however, precipitated us delightfully into the heart of the Arabian Nights atmosphere; and in the winding ways and exotic skyline of Cairo, the Bagdad of Haroun-al-Raschid seemed to live again. Guided by our Baedeker, we had struck east past the Ezbekiyeh Gardens along the Mouski in quest of the native quarter, and were soon in the hands of a clamorous

cicerone who—notwithstanding later developments—was assuredly a master at his trade. Not until afterward did I see that I should have applied at the hotel for a licenced guide. This man, a shaven, peculiarly hollow-voiced, and relatively cleanly fellow who looked like a Pharaoh and called himself "Abdul Reis el Drogman", appeared to have much power over others of his kind; though subsequently the police professed not to know him, and to suggest that *reis* is merely a name for any person in authority, whilst "Drogman" is obviously no more than a clumsy modification of the word for a leader of tourist parties—*dragoman*.

Abdul led us among such wonders as we had before only read and dreamed of. Old Cairo is itself a story-book and a dream—labyrinths of narrow alleys redolent of aromatic secrets; Arabesque balconies and oriels nearly meeting above the cobbled streets; maelstroms of Oriental traffic with strange cries, cracking whips, rattling carts, jingling money, and braying donkeys; kaleidoscopes of polychrome robes, veils, turbans, and tarbushes; water-carriers and dervishes, dogs and cats, soothsayers and barbers; and over all the whining of blind beggars crouched in alcoves, and the sonorous chanting of muezzins from minarets limned delicately against a sky of deep, unchanging blue.

The roofed, quieter bazaars were hardly less alluring. Spice, perfume, incense, beads, rugs, silks, and brass—old Mahmoud Suleiman squats cross-legged amidst his gummy bottles while chattering youths pulverise mustard in the hollowed-out capital of an ancient classic column—a Roman Corinthian, perhaps from neighbouring Heliopolis, where Augustus stationed one of his

three Egyptian legions. Antiquity begins to mingle with exoticism. And then the mosques and the museum—we saw them all, and tried not to let our Arabian revel succumb to the darker charm of Pharaonic Egypt which the museum's priceless treasures offered. That was to be our climax, and for the present we concentrated on the mediaeval Saracenic glories of the Caliphs whose magnificent tomb-mosques form a glittering faery necropolis on the edge of the Arabian Desert.

At length Abdul took us along the Sharia Mohammed Ali to the ancient mosque of Sultan Hassan, and the tower-flanked Bab-el-Azab, beyond which climbs the steep-walled pass to the mighty citadel that Saladin himself built with the stones of forgotten pyramids. It was sunset when we scaled that cliff, circled the modern mosque of Mohammed Ali, and looked down from the dizzying parapet over mystic Cairo—mystic Cairo all golden with its carven domes, its ethereal minarets, and its flaming gardens. Far over the city towered the great Roman dome of the new museum; and beyond it—across the cryptic yellow Nile that is the mother of aeons and dynasties—lurked the menacing sands of the Libyan Desert, undulant and iridescent and evil with older arcana. The red sun sank low, bringing the relentless chill of Egyptian dusk; and as it stood poised on the world's rim like that ancient god of Heliopolis—Re-Harakhte, the Horizon-Sun—we saw silhouetted against its vermeil holocaust the black outlines of the Pyramids of Gizeh—the palaeogean tombs there were hoary with a thousand years when Tut-Ankh-Amen mounted his golden throne in distant Thebes. Then we knew that we were done with Saracen Cairo, and that we must taste the deeper mysteries of primal Egypt—the black Khem of Re and Amen, Isis and Osiris.

The next morning we visited the pyramids, riding out in a Victoria across the great Nile bridge with its bronze lions, the island of Ghizereh with its massive lebbakh trees, and the smaller English bridge to the western shore. Down the shore road we drove, between great rows of lebbakhs and past the vast Zoölogical Gardens to the suburb of Gizeh, where a new bridge to Cairo proper has since been built. Then, turning inland along the Sharia-el-Haram, we crossed a region of glassy canals and shabby native villages till before us loomed the objects of our quest, cleaving the mists of dawn and forming inverted replicas in the roadside pools. Forty centuries, as Napoleon had told his campaigners there, indeed looked down upon us.

The road now rose abruptly, till we finally reached our place of transfer between the trolley station and the Mena House Hotel. Abdul Reis, who capably purchased our pyramid tickets, seemed to have an understanding with the crowding, yelling, and offensive Bedouins who inhabited a squalid mud village some distance away and pestiferously assailed every traveller; for he kept them very decently at bay and secured an excellent pair of camels for us, himself mounting a donkey and assigning the leadership of our animals to a group of men and boys more expensive than useful. The area to be traversed was so small that camels were hardly needed, but we did not regret adding to our experience this troublesome form of desert navigation.

The pyramids stand on a high rock plateau, this group forming next to the northernmost of the series of regal and aristocratic cemeteries built in the neighbourhood of the extinct capital Memphis, which lay on the same side of

the Nile, somewhat south of Gizeh, and which flourished between 3400 and 2000 B. C. The greatest pyramid, which lies nearest the modern road, was built by King Cheops or Khufu about 2800 B. C., and stands more than 450 feet in perpendicular height. In a line southwest from this are successively the Second Pyramid, built a generation later by King Khephren, and though slightly smaller, looking even larger because set on higher ground, and the radically smaller Third Pyramid of King Mycerinus, built about 2700 B. C. Near the edge of the plateau and due east of the Second Pyramid, with a face probably altered to form a colossal portrait of Khephren, its royal restorer, stands the monstrous Sphinx—mute, sardonic, and wise beyond mankind and memory.

Minor pyramids and the traces of ruined minor pyramids are found in several places, and the whole plateau is pitted with the tombs of dignitaries of less than royal rank. These latter were originally marked by *mastabas,* or stone bench-like structures about the deep burial shafts, as found in other Memphian cemeteries and exemplified by Perneb's Tomb in the Metropolitan Museum of New York. At Gizeh, however, all such visible things have been swept away by time and pillage; and only the rock-hewn shafts, either sand-filled or cleared out by archaeologists, remain to attest their former existence. Connected with each tomb was a chapel in which priests and relatives offered food and prayer to the hovering *ka* or vital principle of the deceased. The small tombs have their chapels contained in their stone *mastabas* or superstructures, but the mortuary chapels of the pyramids, where regal Pharaohs lay, were separate temples, each to the east of its corresponding pyramid, and connected

by a causeway to a massive gate-chapel or propylon at the edge of the rock plateau.

The gate-chapel leading to the Second Pyramid, nearly buried in the drifting sands, yawns subterraneously southeast of the Sphinx. Persistent tradition dubs it the "Temple of the Sphinx"; and it may perhaps be rightly called such if the Sphinx indeed represents the Second Pyramid's builder Khephren. There are unpleasant tales of the Sphinx before Khephren—but whatever its elder features were, the monarch replaced them with his own that men might look at the colossus without fear. It was in the great gateway-temple that the life-size diorite statue of Khephren now in the Cairo Museum was found; a statue before which I stood in awe when I beheld it. Whether the whole edifice is now excavated I am not certain, but in 1910 most of it was below ground, with the entrance heavily barred at night. Germans were in charge of the work, and the war or other things may have stopped them. I would give much, in view of my experience and of certain Bedouin whisperings discredited or unknown in Cairo, to know what has developed in connexion with a certain well in a transverse gallery where statues of the Pharaoh were found in curious juxtaposition to the statues of baboons.

The road, as we traversed it on our camels that morning, curved sharply past the wooden police quarters, post-office, drug-store, and shops on the left, and plunged south and east in a complete bend that scaled the rock plateau and brought us face to face with the desert under the lee of the Great Pyramid. Past Cyclopean masonry we rode, rounding the eastern face and looking down ahead into a valley of minor pyramids beyond which the eternal Nile glistened

to the east, and the eternal desert shimmered to the west. Very close loomed the three major pyramids, the greatest devoid of outer casing and showing its bulk of great stones, but the others retaining here and there the neatly fitted covering which had made them smooth and finished in their day.

Presently we descended toward the Sphinx, and sat silent beneath the spell of those terrible unseeing eyes. On the vast stone breast we faintly discerned the emblem of Re-Harakhte, for whose image the Sphinx was mistaken in a late dynasty; and though sand covered the tablet between the great paws, we recalled what Thutmosis IV inscribed thereon, and the dream he had when a prince. It was then that the smile of the Sphinx vaguely displeased us, and made us wonder about the legends of subterranean passages beneath the monstrous creature, leading down, down, to depths none might dare hint at—depths connected with mysteries older than the dynastic Egypt we excavate, and having a sinister relation to the persistence of abnormal, animal-headed gods in the ancient Nilotic pantheon. Then, too, it was I asked myself an idle question whose hideous significance was not to appear for many an hour.

Other tourists now began to overtake us, and we moved on to the sand-choked Temple of the Sphinx, fifty yards to the southeast, which I have previously mentioned as the great gate of the causeway to the Second Pyramid's mortuary chapel on the plateau. Most of it was still underground, and although we dismounted and descended through a modern passageway to its alabaster corridor and pillared hall, I felt that Abdul and the local German attendant had not shown us all there was to see. After this we made the conventional circuit of the pyramid plateau, examining the Second Pyramid and the peculiar ruins

of its mortuary chapel to the east, the Third Pyramid and its miniature southern satellites and ruined eastern chapel, the rock tombs and the honeycombings of the Fourth and Fifth Dynasties, and the famous Campell's Tomb whose shadowy shaft sinks precipitously for 53 feet to a sinister sarcophagus which one of our camel-drivers divested of the cumbering sand after a vertiginous descent by rope.

Cries now assailed us from the Great Pyramid, where Bedouins were besieging a party of tourists with offers of guidance to the top, or of displays of speed in the performance of solitary trips up and down. Seven minutes is said to be the record for such an ascent and descent, but many lusty sheiks and sons of sheiks assured us they could cut it to five if given the requisite impetus of liberal *baksheesh.* They did not get this impetus, though we did let Abdul take us up, thus obtaining a view of unprecedented magnificence which included not only remote and glittering Cairo with its crowned citadel and background of gold-violet hills, but all the pyramids of the Memphian district as well, from Abu Roash on the north to the Dashur on the south. The Sakkara step-pyramid, which marks the evolution of the low *mastaba* into the true pyramid, showed clearly and alluringly in the sandy distance. It is close to this transition-monument that the famed Tomb of Perneb was found—more than 400 miles north of the Theban rock valley where Tut-Ankh-Amen sleeps. Again I was forced to silence through sheer awe. The prospect of such antiquity, and the secrets each hoary monument seemed to hold and brood over, filled me with a reverence and sense of immensity nothing else ever gave me.

Fatigued by our climb, and disgusted with the importunate Bedouins whose actions seemed to defy every rule of taste, we omitted the arduous detail of entering the cramped interior passages of any of the pyramids, though we saw several of the hardiest tourists preparing for the suffocating crawl through Cheops' mightiest memorial. As we dismissed and overpaid our local bodyguard and drove back to Cairo with Abdul Reis under the afternoon sun, we half regretted the omission we had made. Such fascinating things were whispered about lower pyramid passages not in the guide-books; passages whose entrances had been hastily blocked up and concealed by certain uncommunicative archaeologists who had found and begun to explore them. Of course, this whispering was largely baseless on the face of it; but it was curious to reflect how persistently visitors were forbidden to enter the pyramids at night, or to visit the lowest burrows and crypt of the Great Pyramid. Perhaps in the latter case it was the psychological effect which was feared—the effect on the visitor of feeling himself huddled down beneath a gigantic world of solid masonry; joined to the life he has known by the merest tube, in which he may only crawl, and which any accident or evil design might block. The whole subject seemed so weird and alluring that we resolved to pay the pyramid plateau another visit at the earliest possible opportunity. For me this opportunity came much earlier than I expected.

That evening, the members of our party feeling somewhat tired after the strenuous programme of the day, I went alone with Abdul Reis for a walk through the picturesque Arab quarter. Though I had seen it by day, I wished to study the alleys and bazaars in the dusk, when rich shadows and mellow gleams of light would add to their glamour and fantastic illusion. The native

crowds were thinning, but were still very noisy and numerous when we came upon a knot of revelling Bedouins in the Suken-Nahhasin, or bazaar of the coppersmiths. Their apparent leader, an insolent youth with heavy features and saucily cocked tarbush, took some notice of us; and evidently recognised with no great friendliness my competent but admittedly supercilious and sneeringly disposed guide. Perhaps, I thought, he resented that odd reproduction of the Sphinx's half-smile which I had often remarked with amused irritation; or perhaps he did not like the hollow and sepulchral resonance of Abdul's voice. At any rate, the exchange of ancestrally opprobrious language became very brisk; and before long Ali Ziz, as I heard the stranger called when called by no worse name, began to pull violently at Abdul's robe, an action quickly reciprocated, and leading to a spirited scuffle in which both combatants lost their sacredly cherished headgear and would have reached an even direr condition had I not intervened and separated them by main force.

My interference, at first seemingly unwelcome on both sides, succeeded at last in effecting a truce. Sullenly each belligerent composed his wrath and his attire; and with an assumption of dignity as profound as it was sudden, the two formed a curious pact of honour which I soon learned is a custom of great antiquity in Cairo—a pact for the settlement of their difference by means of a nocturnal fist fight atop the Great Pyramid, long after the departure of the last moonlight sightseer. Each duellist was to assemble a party of seconds, and the affair was to begin at midnight, proceeding by rounds in the most civilised possible fashion. In all this planning there was much which excited my interest. The fight itself promised to be unique and spectacular, while the

thought of the scene on that hoary pile overlooking the antediluvian plateau of Gizeh under the wan moon of the pallid small hours appealed to every fibre of imagination in me. A request found Abdul exceedingly willing to admit me to his party of seconds; so that all the rest of the early evening I accompanied him to various dens in the most lawless regions of the town—mostly northeast of the Ezbekiyeh—where he gathered one by one a select and formidable band of congenial cutthroats as his pugilistic background.

Shortly after nine our party, mounted on donkeys bearing such royal or tourist-reminiscent names as "Rameses", "Mark Twain", "J. P. Morgan", and "Minnehaha", edged through street labyrinths both Oriental and Occidental, crossed the muddy and mast-forested Nile by the bridge of the bronze lions, and cantered philosophically between the lebbakhs on the road to Gizeh. Slightly over two hours were consumed by the trip, toward the end of which we passed the last of the returning tourists, saluted the last in-bound trolley-car, and were alone with the night and the past and the spectral moon.

Then we saw the vast pyramids at the end of the avenue, ghoulish with a dim atavistical menace which I had not seemed to notice in the daytime. Even the smallest of them held a hint of the ghastly—for was it not in this that they had buried Queen Nitokris alive in the Sixth Dynasty; subtle Queen Nitokris, who once invited all her enemies to a feast in a temple below the Nile, and drowned them by opening the water-gates? I recalled that the Arabs whisper things about Nitokris, and shun the Third Pyramid at certain phases of the moon. It must have been over her that Thomas Moore was brooding when he wrote a thing muttered about by Memphian boatmen—

"The subterranean nymph that dwells
'Mid sunless gems and glories hid—
The lady of the Pyramid!"

Early as we were, Ali Ziz and his party were ahead of us; for we saw their donkeys outlined against the desert plateau at Kafr-el-Haram; toward which squalid Arab settlement, close to the Sphinx, we had diverged instead of following the regular road to the Mena House, where some of the sleepy, inefficient police might have observed and halted us. Here, where filthy Bedouins stabled camels and donkeys in the rock tombs of Khephren's courtiers, we were led up the rocks and over the sand to the Great Pyramid, up whose time-worn sides the Arabs swarmed eagerly, Abdul Reis offering me the assistance I did not need.

As most travellers know, the actual apex of this structure has long been worn away, leaving a reasonably flat platform twelve yards square. On this eerie pinnacle a squared circle was formed, and in a few moments the sardonic desert moon leered down upon a battle which, but for the quality of the ringside cries, might well have occurred at some minor athletic club in America. As I watched it, I felt that some of our less desirable institutions were not lacking; for every blow, feint, and defence bespoke "stalling" to my not inexperienced eye. It was quickly over, and despite my misgivings as to methods I felt a sort of proprietary pride when Abdul Reis was adjudged the winner.

Reconciliation was phenomenally rapid, and amidst the singing, fraternising, and drinking which followed, I found it difficult to realise that a quarrel had ever occurred. Oddly enough, I myself seemed to be more of a centre of notice than the antagonists; and from my smattering of Arabic I judged that they were discussing my professional performances and escapes from every sort of manacle and confinement, in a manner which indicated not only a surprising knowledge of me, but a distinct hostility and scepticism concerning my feats of escape. It gradually dawned on me that the elder magic of Egypt did not depart without leaving traces, and that fragments of a strange secret lore and priestly cult-practices have survived surreptitiously amongst the fellaheen to such an extent that the prowess of a strange "hahwi" or magician is resented and disputed. I thought of how much my hollow-voiced guide Abdul Reis looked like an old Egyptian priest or Pharaoh or smiling Sphinx ... and wondered.

Suddenly something happened which in a flash proved the correctness of my reflections and made me curse the denseness whereby I had accepted this night's events as other than the empty and malicious "frameup" they now showed themselves to be. Without warning, and doubtless in answer to some subtle sign from Abdul, the entire band of Bedouins precipitated itself upon me; and having produced heavy ropes, soon had me bound as securely as I was ever bound in the course of my life, either on the stage or off. I struggled at first, but soon saw that one man could make no headway against a band of over twenty sinewy barbarians. My hands were tied behind my back, my knees bent to their fullest extent, and my wrists and ankles stoutly linked together with unyielding cords. A stifling gag was forced into my mouth, and a

blindfold fastened tightly over my eyes. Then, as the Arabs bore me aloft on their shoulders and began a jouncing descent of the pyramid, I heard the taunts of my late guide Abdul, who mocked and jeered delightedly in his hollow voice, and assured me that I was soon to have my "magic powers" put to a supreme test which would quickly remove any egotism I might have gained through triumphing over all the tests offered by America and Europe. Egypt, he reminded me, is very old; and full of inner mysteries and antique powers not even conceivable to the experts of today, whose devices had so uniformly failed to entrap me.

How far or in what direction I was carried, I cannot tell; for the circumstances were all against the formation of any accurate judgment. I know, however, that it could not have been a great distance; since my bearers at no point hastened beyond a walk, yet kept me aloft a surprisingly short time. It is this perplexing brevity which makes me feel almost like shuddering whenever I think of Gizeh and its plateau—for one is oppressed by hints of the closeness to every-day tourist routes of what existed then and must exist still.

The evil abnormality I speak of did not become manifest at first. Setting me down on a surface which I recognised as sand rather than rock, my captors passed a rope around my chest and dragged me a few feet to a ragged opening in the ground, into which they presently lowered me with much rough handling. For apparent aeons I bumped against the stony irregular sides of a narrow hewn well which I took to be one of the numerous burial shafts of the plateau until the prodigious, almost incredible depth of it robbed me of all bases of conjecture.

The horror of the experience deepened with every dragging second. That any descent through the sheer solid rock could be so vast without reaching the core of the planet itself, or that any rope made by man could be so long as to dangle me in these unholy and seemingly fathomless profundities of nether earth, were beliefs of such grotesqueness that it was easier to doubt my agitated senses than to accept them. Even now I am uncertain, for I know how deceitful the sense of time becomes when one or more of the usual perceptions or conditions of life is removed or distorted. But I am quite sure that I preserved a logical consciousness that far; that at least I did not add any full-grown phantoms of imagination to a picture hideous enough in its reality, and explicable by a type of cerebral illusion vastly short of actual hallucination.

All this was not the cause of my first bit of fainting. The shocking ordeal was cumulative, and the beginning of the later terrors was a very perceptible increase in my rate of descent. They were paying out that infinitely long rope very swiftly now, and I scraped cruelly against the rough and constricted sides of the shaft as I shot madly downward. My clothing was in tatters, and I felt the trickle of blood all over, even above the mounting and excruciating pain. My nostrils, too, were assailed by a scarcely definable menace; a creeping odour of damp and staleness curiously unlike anything I had ever smelt before, and having faint overtones of spice and incense that lent an element of mockery.

Then the mental cataclysm came. It was horrible—hideous beyond all articulate description because it was all of the soul, with nothing of detail to

describe. It was the ecstasy of nightmare and the summation of the fiendish. The suddenness of it was apocalyptic and demoniac—one moment I was plunging agonisingly down that narrow well of million-toothed torture, yet the next moment I was soaring on bat-wings in the gulfs of hell; swinging free and swoopingly through illimitable miles of boundless, musty space; rising dizzily to measureless pinnacles of chilling ether, then diving gaspingly to sucking nadirs of ravenous, nauseous lower vacua …Thank God for the mercy that shut out in oblivion those clawing Furies of consciousness which half unhinged my faculties, and tore Harpy-like at my spirit! That one respite, short as it was, gave me the strength and sanity to endure those still greater sublimations of cosmic panic that lurked and gibbered on the road ahead.

II

It was very gradually that I regained my senses after that eldritch flight through Stygian space. The process was infinitely painful, and coloured by fantastic dreams in which my bound and gagged condition found singular embodiment. The precise nature of these dreams was very clear while I was experiencing them, but became blurred in my recollection almost immediately afterward, and was soon reduced to the merest outline by the terrible events—real or imaginary—which followed. I dreamed that I was in the grasp of a great and horrible paw; a yellow, hairy, five-clawed paw which had reached out of the earth to crush and engulf me. And when I stopped to reflect what the paw was, it seemed to me that it was Egypt. In the dream I looked back at the events of the preceding weeks, and saw myself lured and enmeshed little by little, subtly and insidiously, by some hellish ghoul-spirit of the elder Nile

sorcery; some spirit that was in Egypt before ever man was, and that will be when man is no more.

I saw the horror and unwholesome antiquity of Egypt, and the grisly alliance it has always had with the tombs and temples of the dead. I saw phantom processions of priests with the heads of bulls, falcons, cats, and ibises; phantom processions marching interminably through subterraneous labyrinths and avenues of titanic propylaea beside which a man is as a fly, and offering unnamable sacrifices to indescribable gods. Stone colossi marched in endless night and drove herds of grinning androsphinxes down to the shores of illimitable stagnant rivers of pitch. And behind it all I saw the ineffable malignity of primordial necromancy, black and amorphous, and fumbling greedily after me in the darkness to choke out the spirit that had dared to mock it by emulation. In my sleeping brain there took shape a melodrama of sinister hatred and pursuit, and I saw the black soul of Egypt singling me out and calling me in inaudible whispers; calling and luring me, leading me on with the glitter and glamour of a Saracenic surface, but ever pulling me down to the age-mad catacombs and horrors of its dead and abysmal pharaonic heart.

Then the dream-faces took on human resemblances, and I saw my guide Abdul Reis in the robes of a king, with the sneer of the Sphinx on his features. And I knew that those features were the features of Khephren the Great, who raised the Second Pyramid, carved over the Sphinx's face in the likeness of his own, and built that titanic gateway temple whose myriad corridors the archaeologists think they have dug out of the cryptical sand and the uninformative rock. And I looked at the long, lean, rigid hand of Khephren;

the long, lean, rigid hand as I had seen it on the diorite statue in the Cairo Museum—the statue they had found in the terrible gateway temple—and wondered that I had not shrieked when I saw it on Abdul Reis … That hand! It was hideously cold, and it was crushing me; it was the cold and cramping of the sarcophagus … the chill and constriction of unrememberable Egypt … It was nighted, necropolitan Egypt itself … that yellow paw …. and they whisper such things of Khephren …

But at this juncture I began to awake—or at least, to assume a condition less completely that of sleep than the one just preceding. I recalled the fight atop the pyramid, the treacherous Bedouins and their attack, my frightful descent by rope through endless rock depths, and my mad swinging and plunging in a chill void redolent of aromatic putrescence. I perceived that I now lay on a damp rock floor, and that my bonds were still biting into me with unloosened force. It was very cold, and I seemed to detect a faint current of noisome air sweeping across me. The cuts and bruises I had received from the jagged sides of the rock shaft were paining me woefully, their soreness enhanced to a stinging or burning acuteness by some pungent quality in the faint draught, and the mere act of rolling over was enough to set my whole frame throbbing with untold agony. As I turned I felt a tug from above, and concluded that the rope whereby I was lowered still reached to the surface. Whether or not the Arabs still held it, I had no idea; nor had I any idea how far within the earth I was. I knew that the darkness around me was wholly or nearly total, since no ray of moonlight penetrated my blindfold; but I did not trust my senses enough to accept as evidence of extreme depth the sensation of vast duration which had characterised my descent.

Knowing at least that I was in a space of considerable extent reached from the surface directly above by an opening in the rock, I doubtfully conjectured that my prison was perhaps the buried gateway chapel of old Khephren—the Temple of the Sphinx—perhaps some inner corridor which the guides had not shown me during my morning visit, and from which I might easily escape if I could find my way to the barred entrance. It would be a labyrinthine wandering, but no worse than others out of which I had in the past found my way. The first step was to get free of my bonds, gag, and blindfold; and this I knew would be no great task, since subtler experts than these Arabs had tried every known species of fetter upon me during my long and varied career as an exponent of escape, yet had never succeeded in defeating my methods.

Then it occurred to me that the Arabs might be ready to meet and attack me at the entrance upon any evidence of my probable escape from the binding cords, as would be furnished by any decided agitation of the rope which they probably held. This, of course, was taking for granted that my place of confinement was indeed Khephren's Temple of the Sphinx. The direct opening in the roof, wherever it might lurk, could not be beyond easy reach of the ordinary modern entrance near the Sphinx; if in truth it were any great distance at all on the surface, since the total area known to visitors is not at all enormous. I had not noticed any such opening during my daytime pilgrimage, but knew that these things are easily overlooked amidst the drifting sands. Thinking these matters over as I lay bent and bound on the rock floor, I nearly forgot the horrors of the abysmal descent and cavernous swinging which had so lately reduced me to a coma. My present thought was only to outwit the

Arabs, and I accordingly determined to work myself free as quickly as possible, avoiding any tug on the descending line which might betray an effective or even problematical attempt at freedom.

This, however, was more easily determined than effected. A few preliminary trials made it clear that little could be accomplished without considerable motion; and it did not surprise me when, after one especially energetic struggle, I began to feel the coils of falling rope as they piled up about me and upon me. Obviously, I thought, the Bedouins had felt my movements and released their end of the rope; hastening no doubt to the temple's true entrance to lie murderously in wait for me. The prospect was not pleasing—but I had faced worse in my time without flinching, and would not flinch now. At present I must first of all free myself of bonds, then trust to ingenuity to escape from the temple unharmed. It is curious how implicitly I had come to believe myself in the old temple of Khephren beside the Sphinx, only a short distance below the ground.

That belief was shattered, and every pristine apprehension of preternatural depth and daemoniac mystery revived, by a circumstance which grew in horror and significance even as I formulated my philosophical plan. I have said that the falling rope was piling up about and upon me. Now I saw that it was continuing to pile, as no rope of normal length could possibly do. It gained in momentum and became an avalanche of hemp, accumulating mountainously on the floor, and half burying me beneath its swiftly multiplying coils. Soon I was completely engulfed and gasping for breath as the increasing convolutions submerged and stifled me. My senses tottered

again, and I vainly tried to fight off a menace desperate and ineluctable. It was not merely that I was tortured beyond human endurance—not merely that life and breath seemed to be crushed slowly out of me—it was the knowledge of what those unnatural lengths of rope implied, and the consciousness of what unknown and incalculable gulfs of inner earth must at this moment be surrounding me. My endless descent and swinging flight through goblin space, then, must have been real; and even now I must be lying helpless in some nameless cavern world toward the core of the planet. Such a sudden confirmation of ultimate horror was insupportable, and a second time I lapsed into merciful oblivion.

When I say oblivion, I do not imply that I was free from dreams. On the contrary, my absence from the conscious world was marked by visions of the most unutterable hideousness. God! . . . If only I had not read so much Egyptology before coming to this land which is the fountain of all darkness and terror! This second spell of fainting filled my sleeping mind anew with shivering realisation of the country and its archaic secrets, and through some damnable chance my dreams turned to the ancient notions of the dead and their sojournings in soul and body beyond those mysterious tombs which were more houses than graves. I recalled, in dream-shapes which it is well that I do not remember, the peculiar and elaborate construction of Egyptian sepulchres; and the exceedingly singular and terrific doctrines which determined this construction.

All these people thought of was death and the dead. They conceived of a literal resurrection of the body which made them mummify it with desperate care,

and preserve all the vital organs in canopic jars near the corpse; whilst besides the body they believed in two other elements, the soul, which after its weighing and approval by Osiris dwelt in the land of the blest, and the obscure and portentous ka or life-principle which wandered about the upper and lower worlds in a horrible way, demanding occasional access to the preserved body, consuming the food offerings brought by priests and pious relatives to the mortuary chapel, and sometimes—as men whispered—taking its body or the wooden double always buried beside it and stalking noxiously abroad on errands peculiarly repellent.

For thousands of years those bodies rested gorgeously encased and staring glassily upward when not visited by the ka, awaiting the day when Osiris should restore both ka and soul, and lead forth the stiff legions of the dead from the sunken houses of sleep. It was to have been a glorious rebirth—but not all souls were approved, nor were all tombs inviolate, so that certain grotesque mistakes and fiendish abnormalities were to be looked for. Even today the Arabs murmur of unsanctified convocations and unwholesome worship in forgotten nether abysses, which only winged invisible kas and soulless mummies may visit and return unscathed.

Perhaps the most leeringly blood-congealing legends are those which relate to certain perverse products of decadent priestcraft—composite mummies made by the artificial union of human trunks and limbs with the heads of animals in imitation of the elder gods. At all stages of history the sacred animals were mummified, so that consecrated bulls, cats, ibises, crocodiles, and the like might return some day to greater glory. But only in the decadence did they

mix the human and animal in the same mummy—only in the decadence, when they did not understand the rights and prerogatives of the ka and the soul. What happened to those composite mummies is not told of—at least publicly—and it is certain that no Egyptologist ever found one. The whispers of Arabs are very wild, and cannot be relied upon. They even hint that old Khephren—he of the Sphinx, the Second Pyramid, and the yawning gateway temple—lives far underground wedded to the ghoul-queen Nitokris and ruling over the mummies that are neither of man nor of beast.

It was of these—of Khephren and his consort and his strange armies of the hybrid dead—that I dreamed, and that is why I am glad the exact dream-shapes have faded from my memory. My most horrible vision was connected with an idle question I had asked myself the day before when looking at the great carven riddle of the desert and wondering with what unknown depths the temple so close to it might be secretly connected. That question, so innocent and whimsical then, assumed in my dream a meaning of frenetic and hysterical madness . . . what huge and loathsome abnormality was the Sphinx originally carven to represent?

My second awakening—if awakening it was—is a memory of stark hideousness which nothing else in my life—save one thing which came after—can parallel; and that life has been full and adventurous beyond most men's. Remember that I had lost consciousness whilst buried beneath a cascade of falling rope whose immensity revealed the cataclysmic depth of my present position. Now, as perception returned, I felt the entire weight gone; and realised upon rolling over that although I was still tied, gagged, and

blindfolded, some agency had removed completely the suffocating hempen landslide which had overwhelmed me. The significance of this condition, of course, came to me only gradually; but even so I think it would have brought unconsciousness again had I not by this time reached such a state of emotional exhaustion that no new horror could make much difference. I was alone . . . with what?

Before I could torture myself with any new reflection, or make any fresh effort to escape from my bonds, an additional circumstance became manifest. Pains not formerly felt were racking my arms and legs, and I seemed coated with a profusion of dried blood beyond anything my former cuts and abrasions could furnish. My chest, too, seemed pierced by an hundred wounds, as though some malign, titanic ibis had been pecking at it. Assuredly the agency which had removed the rope was a hostile one, and had begun to wreak terrible injuries upon me when somehow impelled to desist. Yet at the time my sensations were distinctly the reverse of what one might expect. Instead of sinking into a bottomless pit of despair, I was stirred to a new courage and action; for now I felt that the evil forces were physical things which a fearless man might encounter on an even basis.

On the strength of this thought I tugged again at my bonds, and used all the art of a lifetime to free myself as I had so often done amidst the glare of lights and the applause of vast crowds. The familiar details of my escaping process commenced to engross me, and now that the long rope was gone I half regained my belief that the supreme horrors were hallucinations after all, and that there had never been any terrible shaft, measureless abyss, or interminable

rope. Was I after all in the gateway temple of Khephren beside the Sphinx, and had the sneaking Arabs stolen in to torture me as I lay helpless there? At any rate, I must be free. Let me stand up unbound, ungagged, and with eyes open to catch any glimmer of light which might come trickling from any source, and I could actually delight in the combat against evil and treacherous foes!

How long I took in shaking off my encumbrances I cannot tell. It must have been longer than in my exhibition performances, because I was wounded, exhausted, and enervated by the experiences I had passed through. When I was finally free, and taking deep breaths of a chill, damp, evilly spiced air all the more horrible when encountered without the screen of gag and blindfold edges, I found that I was too cramped and fatigued to move at once. There I lay, trying to stretch a frame bent and mangled, for an indefinite period, and straining my eyes to catch a glimpse of some ray of light which would give a hint as to my position.

By degrees my strength and flexibility returned, but my eyes beheld nothing. As I staggered to my feet I peered diligently in every direction, yet met only an ebony blackness as great as that I had known when blindfolded. I tried my legs, blood-encrusted beneath my shredded trousers, and found that I could walk; yet could not decide in what direction to go. Obviously I ought not to walk at random, and perhaps retreat directly from the entrance I sought; so I paused to note the direction of the cold, foetid, natron-scented air-current which I had never ceased to feel. Accepting the point of its source as the

possible entrance to the abyss, I strove to keep track of this landmark and to walk consistently toward it.

I had had a match box with me, and even a small electric flashlight; but of course the pockets of my tossed and tattered clothing were long since emptied of all heavy articles. As I walked cautiously in the blackness, the draught grew stronger and more offensive, till at length I could regard it as nothing less than a tangible stream of detestable vapour pouring out of some aperture like the smoke of the genie from the fisherman's jar in the Eastern tale. The East ... Egypt … truly, this dark cradle of civilisation was ever the well-spring of horrors and marvels unspeakable! The more I reflected on the nature of this cavern wind, the greater my sense of disquiet became; for although despite its odour I had sought its source as at least an indirect clue to the outer world, I now saw plainly that this foul emanation could have no admixture or connexion whatsoever with the clean air of the Libyan Desert, but must be essentially a thing vomited from sinister gulfs still lower down. I had, then, been walking in the wrong direction!

After a moment's reflection I decided not to retrace my steps. Away from the draught I would have no landmarks, for the roughly level rock floor was devoid of distinctive configurations. If, however, I followed up the strange current, I would undoubtedly arrive at an aperture of some sort, from whose gate I could perhaps work round the walls to the opposite side of this Cyclopean and otherwise unnavigable hall. That I might fail, I well realised. I saw that this was no part of Khephren's gateway temple which tourists know, and it struck me that this particular hall might be unknown even to

archaeologists, and merely stumbled upon by the inquisitive and malignant Arabs who had imprisoned me. If so, was there any present gate of escape to the known parts or to the outer air?

What evidence, indeed, did I now possess that this was the gateway temple at all? For a moment all my wildest speculations rushed back upon me, and I thought of that vivid mélange of impressions—descent, suspension in space, the rope, my wounds, and the dreams that were frankly dreams. Was this the end of life for me? Or indeed, would it be merciful if this moment were the end? I could answer none of my own questions, but merely kept on till Fate for a third time reduced me to oblivion. This time there were no dreams, for the suddenness of the incident shocked me out of all thought either conscious or subconscious. Tripping on an unexpected descending step at a point where the offensive draught became strong enough to offer an actual physical resistance, I was precipitated headlong down a black flight of huge stone stairs into a gulf of hideousness unrelieved.

That I ever breathed again is a tribute to the inherent vitality of the healthy human organism. Often I look back to that night and feel a touch of actual humour in those repeated lapses of consciousness; lapses whose succession reminded me at the time of nothing more than the crude cinema melodramas of that period. Of course, it is possible that the repeated lapses never occurred; and that all the features of that underground nightmare were merely the dreams of one long coma which began with the shock of my descent into that abyss and ended with the healing balm of the outer air and

of the rising sun which found me stretched on the sands of Gizeh before the sardonic and dawn-flushed face of the Great Sphinx.

I prefer to believe this latter explanation as much as I can, hence was glad when the police told me that the barrier to Khephren's gateway temple had been found unfastened, and that a sizeable rift to the surface did actually exist in one corner of the still buried part. I was glad, too, when the doctors pronounced my wounds only those to be expected from my seizure, blindfolding, lowering, struggling with bonds, falling some distance—perhaps into a depression in the temple's inner gallery—dragging myself to the outer barrier and escaping from it, and experiences like that . . . a very soothing diagnosis. And yet I know that there must be more than appears on the surface. That extreme descent is too vivid a memory to be dismissed—and it is odd that no one has ever been able to find a man answering the description of my guide Abdul Reis el Drogman—the tomb-throated guide who looked and smiled like King Khephren.

I have digressed from my connected narrative—perhaps in the vain hope of evading the telling of that final incident; that incident which of all is most certainly an hallucination. But I promised to relate it, and do not break promises. When I recovered—or seemed to recover—my senses after that fall down the black stone stairs, I was quite as alone and in darkness as before. The windy stench, bad enough before, was now fiendish; yet I had acquired enough familiarity by this time to bear it stoically. Dazedly I began to crawl away from the place whence the putrid wind came, and with my bleeding hands felt the colossal blocks of a mighty pavement. Once my head struck

against a hard object, and when I felt of it I learned that it was the base of a column—a column of unbelievable immensity—whose surface was covered with gigantic chiselled hieroglyphics very perceptible to my touch. Crawling on, I encountered other titan columns at incomprehensible distances apart; when suddenly my attention was captured by the realisation of something which must have been impinging on my subconscious hearing long before the conscious sense was aware of it.

From some still lower chasm in earth's bowels were proceeding certain sounds, measured and definite, and like nothing I had ever heard before. That they were very ancient and distinctly ceremonial, I felt almost intuitively; and much reading in Egyptology led me to associate them with the flute, the sambuke, the sistrum, and the tympanum. In their rhythmic piping, droning, rattling, and beating I felt an element of terror beyond all the known terrors of earth—a terror peculiarly dissociated from personal fear, and taking the form of a sort of objective pity for our planet, that it should hold within its depths such horrors as must lie beyond these aegipanic cacophonies. The sounds increased in volume, and I felt that they were approaching. Then—and may all the gods of all pantheons unite to keep the like from my ears again—I began to hear, faintly and afar off, the morbid and millennial tramping of the marching things.

It was hideous that footfalls so dissimilar should move in such perfect rhythm. The training of unhallowed thousands of years must lie behind that march of earth's inmost monstrosities ... padding, clicking, walking, stalking, rumbling, lumbering, crawling … and all to the abhorrent discords of those mocking

instruments. And then … God keep the memory of those Arab legends out of my head! The mummies without souls … the meeting-place of the wandering kas … the hordes of the devil-cursed pharaonic dead of forty centuries … the composite mummies led through the uttermost onyx voids by King Khephren and his ghoul-queen Nitokris…

The tramping drew nearer—heaven save me from the sound of those feet and paws and hooves and pads and talons as it commenced to acquire detail! Down limitless reaches of sunless pavement a spark of light flickered in the malodorous wind, and I drew behind the enormous circumference of a Cyclopic column that I might escape for a while the horror that was stalking million-footed toward me through gigantic hypostyles of inhuman dread and phobic antiquity. The flickers increased, and the tramping and dissonant rhythm grew sickeningly loud. In the quivering orange light there stood faintly forth a scene of such stony awe that I gasped from a sheer wonder that conquered even fear and repulsion. Bases of columns whose middles were higher than human sight ... mere bases of things that must each dwarf the Eiffel Tower to insignificance ... hieroglyphics carved by unthinkable hands in caverns where daylight can be only a remote legend …

I would not look at the marching things. That I desperately resolved as I heard their creaking joints and nitrous wheezing above the dead music and the dead tramping. It was merciful that they did not speak ... but God! their crazy torches began to cast shadows on the surface of those stupendous columns. Heaven take it away! Hippopotami should not have human hands and carry torches ... men should not have the heads of crocodiles …

I tried to turn away, but the shadows and the sounds and the stench were everywhere. Then I remembered something I used to do in half-conscious nightmares as a boy, and began to repeat to myself, “This is a dream! This is a dream!” But it was of no use, and I could only shut my eyes and pray ... at least, that is what I think I did, for one is never sure in visions—and I know this can have been nothing more. I wondered whether I should ever reach the world again, and at times would furtively open my eyes to see if I could discern any feature of the place other than the wind of spiced putrefaction, the topless columns, and the thaumatropically grotesque shadows of abnormal horror. The sputtering glare of multiplying torches now shone, and unless this hellish place were wholly without walls, I could not fail to see some boundary or fixed landmark soon. But I had to shut my eyes again when I realised how many of the things were assembling—and when I glimpsed a certain object walking solemnly and steadily without any body above the waist.

A fiendish and ululant corpse-gurgle or death-rattle now split the very atmosphere—the charnel atmosphere poisonous with naphtha and bitumen blasts—in one concerted chorus from the ghoulish legion of hybrid blasphemies. My eyes, perversely shaken open, gazed for an instant upon a sight which no human creature could even imagine without panic fear and physical exhaustion. The things had filed ceremonially in one direction, the direction of the noisome wind, where the light of their torches showed their bended heads ... or the bended heads of such as had heads ... They were worshipping before a great black foetor-belching aperture which reached up almost out of sight, and which I could see was flanked at right angles by two

giant staircases whose ends were far away in shadow. One of these was indubitably the staircase I had fallen down.

The dimensions of the hole were fully in proportion with those of the columns—an ordinary house would have been lost in it, and any average public building could easily have been moved in and out. It was so vast a surface that only by moving the eye could one trace its boundaries ... so vast, so hideously black, and so aromatically stinking ... Directly in front of this yawning Polyphemus-door the things were throwing objects—evidently sacrifices or religious offerings, to judge by their gestures. Khephren was their leader; sneering King Khephren or the guide Abdul Reis, crowned with a golden pshent and intoning endless formulae with the hollow voice of the dead. By his side knelt beautiful Queen Nitokris, whom I saw in profile for a moment, noting that the right half of her face was eaten away by rats or other ghouls. And I shut my eyes again when I saw what objects were being thrown as offerings to the foetid aperture or its possible local deity.

It occurred to me that judging from the elaborateness of this worship, the concealed deity must be one of considerable importance. Was it Osiris or Isis, Horus or Anubis, or some vast unknown God of the Dead still more central and supreme? There is a legend that terrible altars and colossi were reared to an Unknown One before ever the known gods were worshipped …

And now, as I steeled myself to watch the rapt and sepulchral adorations of those nameless things, a thought of escape flashed upon me. The hall was dim, and the columns heavy with shadow. With every creature of that nightmare

throng absorbed in shocking raptures, it might be barely possible for me to creep past to the faraway end of one of the staircases and ascend unseen; trusting to Fate and skill to deliver me from the upper reaches. Where I was, I neither knew nor seriously reflected upon—and for a moment it struck me as amusing to plan a serious escape from that which I knew to be a dream. Was I in some hidden and unsuspected lower realm of Khephren's gateway temple—that temple which generations have persistently called the Temple of the Sphinx? I could not conjecture, but I resolved to ascend to life and consciousness if wit and muscle could carry me.

Wriggling flat on my stomach, I began the anxious journey toward the foot of the left-hand staircase, which seemed the more accessible of the two. I cannot describe the incidents and sensations of that crawl, but they may be guessed when one reflects on what I had to watch steadily in that malign, wind-blown torchlight in order to avoid detection. The bottom of the staircase was, as I have said, far away in shadow; as it had to be to rise without a bend to the dizzy parapeted landing above the titanic aperture. This placed the last stages of my crawl at some distance from the noisome herd, though the spectacle chilled me even when quite remote at my right.

At length I succeeded in reaching the steps and began to climb; keeping close to the wall, on which I observed decorations of the most hideous sort, and relying for safety on the absorbed, ecstatic interest with which the monstrosities watched the foul-breezed aperture and the impious objects of nourishment they had flung on the pavement before it. Though the staircase was huge and steep, fashioned of vast porphyry blocks as if for the feet of a

giant, the ascent seemed virtually interminable. Dread of discovery and the pain which renewed exercise had brought to my wounds combined to make that upward crawl a thing of agonising memory. I had intended, on reaching the landing, to climb immediately onward along whatever upper staircase might mount from there; stopping for no last look at the carrion abominations that pawed and genuflected some seventy or eighty feet below—yet a sudden repetition of that thunderous corpse-gurgle and death-rattle chorus, coming as I had nearly gained the top of the flight and showing by its ceremonial rhythm that it was not an alarm of my discovery, caused me to pause and peer cautiously over the parapet.

The monstrosities were hailing something which had poked itself out of the nauseous aperture to seize the hellish fare proffered it. It was something quite ponderous, even as seen from my height; something yellowish and hairy, and endowed with a sort of nervous motion. It was as large, perhaps, as a good-sized hippopotamus, but very curiously shaped. It seemed to have no neck, but five separate shaggy heads springing in a row from a roughly cylindrical trunk; the first very small, the second good-sized, the third and fourth equal and largest of all, and the fifth rather small, though not so small as the first. Out of these heads darted curious rigid tentacles which seized ravenously on the excessively great quantities of unmentionable food placed before the aperture. Once in a while the thing would leap up, and occasionally it would retreat into its den in a very odd manner. Its locomotion was so inexplicable that I stared in fascination, wishing it would emerge further from the cavernous lair beneath me.

Then it did emerge … it did emerge, and at the sight I turned and fled into the darkness up the higher staircase that rose behind me; fled unknowingly up incredible steps and ladders and inclined planes to which no human sight or logic guided me, and which I must ever relegate to the world of dreams for want of any confirmation. It must have been dream, or the dawn would never have found me breathing on the sands of Gizeh before the sardonic dawn-flushed face of the Great Sphinx.

The Great Sphinx! God!—that idle question I asked myself on that sun-blest morning before … what huge and loathsome abnormality was the Sphinx originally carven to represent? Accursed is the sight, be it in dream or not, that revealed to me the supreme horror—the Unknown God of the Dead, which licks its colossal chops in the unsuspected abyss, fed hideous morsels by soulless absurdities that should not exist. The five-headed monster that emerged ... that five-headed monster as large as a hippopotamus ... the five-headed monster—and that of which it is the merest fore paw …

But I survived, and I know it was only a dream.

Good Time Johnny by Ed Regis

John von Neumann (1903-1957)

The roulette wheel spins, the white acetate ball goes one way, the wheel itself the other, but all eyes are on the ball as the numbers— alternating black and red squares—rush by in a blur. The room is totally quiet, the only sounds the whir of the air rushing past the wheel frets and the murmur of the ball as it careens its way around the rotor like a moon around a planet. Like many gamblers, the watchers think they know which number's going to come up—or, in this case, at least approximately which one. Roulette wheel rotors are divided up into eight sections, or octants, and the watchers are betting that the ball will land somewhere in the fifth octant, which covers the numbers 18, 31, 19, 8, and 12.

The rotor slows and the ball starts down toward the metal diamonds on the sides of the wheel. If the ball hits one of them, its trajectory will be altered,

randomized somewhat, making the fifth octant not such a good bet after all, but the ball drops past the diamonds without touching any of them, and settles in toward the slots below. It arcs over the face of the numbers— alternating even and odd, black and white—and as it does so the fifth octant comes around right on cue, the ball drops into the cups—click, click, click, it bounces in and out—and then comes to rest exactly where it's supposed to, at number 19. It's cradled there in its cup like an egg in an egg carton as the wheel slowly glides to a stop.

The watchers are happy enough, but they don't stomp and cheer as amateur gamblers might, nor do they collect any money, for, although it's a regulation roulette wheel that they've got in front of them, made by B.C. Wills, of Detroit, and purchased from Paul's Gaming Devices in Reno, Nevada, this is not Reno, Las Vegas, or even Atlantic City. This spin of fortune took place in Princeton, New Jersey, at the Institute for Advanced Study. In a hidden aerie up on the third floor of Fuld Hall, two floors above the very spot where Albert Einstein used to sit and think … about how *God doesn't play dice* with the universe, two young physicists are perfecting a new gambling system.

Standing on either side of the wheel are J. Doyne Farmer, currently an Oppenheimer fellow at the Los Alamos National Laboratory, and Norman Packard, Farmer's childhood friend from back in Silver City, New Mexico, where they both grew up. Packard is now a long-term member of the Institute for Advanced Study, one of a small number of scientists who make up Stephen Wolfram's complex systems group. Farmer, trained as an astrophysicist, and accustomed to thinking about tiny spheres orbiting large spinning bodies, had

written a computer program that he hoped would simulate the dynamics of a roulette ball so closely that he'd be able to predict its exact landing spot. The idea was to take the program, inside a concealed computer, into the Las Vegas casinos and make a fortune. Packard and Farmer had tried it out at Vegas several times, and they seemed to be averaging a 40 percent margin over the casino, but then a series of technical glitches, having to do with the computer hardware, not with the program, forced them out of action. Later, word of the project got out in the popular press—in the book *The Eudaemonic Pie*, portions of which had been serialized in *Science Digest* in 1985—and that pretty much killed off their chances of making a small fortune, at least for a while. But the two of them are back at it again now, although this time it's as much from a sense of closure— a sense that they have to finish the project for its own sake—as it is to go out and break the banks at Monte Carlo.

The amazing thing about this roulette wheel, though, isn't that Farmer and Packard can predict outcome of plays much better than chance, but that the experiment is taking place in the hallowed precincts of Fuld Hall … and nobody is raising a ruckus. The One True Platonic Heaven has been turned into a gambling casino laboratory, and these guys are getting away with it! The roulette wheel, true enough, isn't out in the open where just anyone might happen onto it during a day's cerebral work at the Paradise for Scholars. But it's not as if Packard and Farmer have made any overt attempt to hide it from prying eyes, it's just that outsiders never come all the way up here to the third floor of Fuld Hall. And if they did, all they'd see is a closed door which, if they opened it, would reveal a roomful of computers and other doorways going off into other rooms, like a maze. The roulette wheel is in one of these

back rooms, which is just as well, because if the Institute regulars—especially those in social science or in historical studies—if they ever discovered that a couple of scientists were up there … playing roulette! …well, there'd be hell to pay. Just think of what happened the only other time anyone at the Institute conducted an experiment.

The guilty party on that occasion was John von Neumann. Here, in this most celestial of all ivory-tower environments, where the heaviest piece of equipment is a piece of chalk, where the loudest noise is that of a few papers rustling in the library, von Neumann went ahead and constructed a new species of electronic computer. No imaginary abstraction, this was the real thing, a nuts-and-bolts, angle-iron-and-sheet-metal machine. It had a stack at the top, a flue, an exhaust pipe up which the heat of all the glowing filaments and vacuum tubes inside could escape. Just like a steam engine.

To the Institute regulars this stuff was unthinkable. These Monster Minds had come to Princeton specifically to get away from the crass world of noise and machines, to a place where they could think their deep thoughts in peace and quiet … and here was Johnny von Neumann turning their unworldly paradise into … a *shop*! Using their monastic Institute facilities to build … an *appliance*!

This was no way to behave at the Institute, the One True Platonic Heaven. It was unworthy. It was heretical. It would have to be stopped, and ultimately the Institute regulars got rid of the thing. But that was after von Neumann had died. Although they hated and had no use for his ugly electronic contraption,

nobody could stay mad at von Neumann for very long. He was too likeable. He gave these immense parties, the best ones in Princeton. He loved women and fast cars. He loved jokes, limericks, and off-color stories. He loved noise, Mexican food, fine wines, and money. You just couldn't hate a man like that, and so the Institute regulars made allowances and exceptions for von Neumann that they would not have considered for anyone else. For all his dirty-handed messing with computers, he was still one of the high-minded luminaries, one of the immortals, one of the gods that trod upon Earth. "The story used to be told about him in Princeton," Herman Goldstine has written, "that while he was indeed a demi-god, he had made a detailed study of humans and could imitate them perfectly."

Indeed, von Neumann's work on computers and cellular automata wasn't even half of his life's work; it was more like a fifth, or even less. He had talent for creating whole new branches of mathematics, like game theory, for example. To von Neumann, proving the *Ergodic Theorem* was not inherently a more worthy activity than predicting the weather, building a computer, or teaching the titans of commerce how to take advantage of game theory the better to position themselves in the dog-eat-dog business world. At Los Alamos during the Manhattan Project, Enrico Fermi used to taunt Edward Teller: "Edward-a how come-a the Hungarians have not-a invented anything?" But von Neumann, who was Hungarian himself, helped invent the implosion mechanism for the first atom bomb and then, along with Teller, Stanislaw Ulam, and others, went on to invent the H bomb. It wasn't quite right—indeed it was horrible, truly dismaying!—to see this Institute professor building computers and making bombs as happily as he invented mathematical

disciplines and raked in money from his various consulting jobs. But who could hold it against Johnny? Nobody. He was just too much of a good-time boy.

It was a portentous year for science and technology. In February of 1903, the New York Times carried its first story on "the much talked of radium," and news of radioactive elements was broadcast around the world. Later, in October, the St. Louis Post Dispatch ran a story which said of radium that, "Its power will be inconceivable. By means of the metal all the arsenals of the-world would be destroyed. It could make war impossible by exhausting all the accumulated explosives in the world... It is even possible that an instrument might be invented which at the touch of a key would blow up the whole earth and bring about the end of the world."

Of course a few good things happened that same year. On December 17, 1903, on a beach in North Carolina, the Wright brothers made their first four-powered, controlled flights across the sand, starting us down the road to space. Eleven days later John von Neumann was born in Budapest. He would take us into the age of computers, robots, and artificial intelligence. The son of a well-to-do banker, Johnny was not a late bloomer like Einstein. By the time he was six Johnny was dividing two 8-digit numbers in his head and joking with his father in ancient Greek. Two years later he was doing calculus and showing off his photographic memory by reading a page of the Budapest telephone directory and repeating back the names, addresses and phone numbers with his eyes closed. Once, when his mother was sewing, she paused

for a moment and stared off into space. The boy, looking at her, asked, "Mother, what are you calculating?"

Johnny enrolled at the University of Budapest, which he used mainly as a base of operations and refueling point for his travels—to Berlin, to hear Einstein lecture on statistical mechanics, to Zurich where he enrolled in the chemical engineering program at the famed ETH, and of course to Gottingen, where he would study with the renowned mathematician David Hilbert. At the age of twenty-two von Neumann crowned all this feverish activity by getting two degrees, an undergraduate diploma from ETH in chemical engineering, and a Ph.D. from the University of Budapest, *summa cum laude* in mathematics—with minors in experimental physics and chemistry thrown in for good measure.

When he arrived at Gottingen, quantum mechanics was just coming onto center stage. The challenge was to give a consistent mathematical description of the atom, one that would encompass the rival theories advanced by Werner Heisenberg and Erwin Schrodinger. After getting his degrees, von Neumann applied himself to the problem of combining the two, and during the years 1925 to 1929 wrote a series of papers that he would in 1932 publish as his first book, *Mathematical Foundations of Quantum Mechanics.* Today, more than fifty years later, it is still in print.

The key to von Neumann's account of the quantum is his use of "Hilbert space," a notion Hilbert had invented for the purpose of studying equations

with infinitely many variables. If you wanted to solve a pair of simultaneous equations, such as

$$x — y = 1$$

and

$$x + y = 7,$$

then you could find the values of x and y in either of two ways. You could use elementary algebra and find a solution arithmetically, or you could use the techniques of analytic geometry. To do this you'd plot both formulas on the same pair of axes; if there was a valid solution to the two equations simultaneously, then the resulting curves would intersect at a common point, whose x and y coordinates would be the correct values of the two unknowns.

The same process can be applied to formulas having more unknowns, so that if you had the equation

$$x^2 + y^2 + z^2 = 1,$$

then adding a z-axis will create a three-dimensional space, onto which this new equation can be plotted. Doing so gives in this case a sphere of radius 1, with its center at the common intersection of the three axes.

An equation can be plotted even if it has more than three unknowns, but doing this means leaving the ordinary world of three dimensions and entering into the twilight-zone realm of Hilbert space. More variables mean more axes in the graph: an equation with five unknowns, for example, will describe a five-

dimensional sphere, or "*hypersphere*." What Hilbert did was to extend this progression to cover equations with infinitely many variables, the geometric representation of which would require a space with infinitely many dimensions. Such a space, it's true, is not a physical space—so long as physical space is understood to be composed of the usual three dimensions. Nevertheless, mathematicians and physicists use this infinitely dimensioned Hilbert space routinely, especially in the context of quantum theory, to solve real-world problems. That they do so is largely owed to von Neumann.

In the mid-1920s, two opposed interpretations of quantum phenomena were making things tough for physicists. One was Heisenberg's matrix mechanics; the other was Schrodinger's wave-function theory, and physicists didn't know which of the two to believe. According to Werner Heisenberg, a quantum system's attributes are expressed in matrices— rectangular arrays of numbers such as those on a bingo card or on the periodic table of the elements. Each matrix of numbers represents a different attribute, and so there's one matrix for a quantum's energy-level, another one for position, another for momentum, and so on. Heisenberg used a matrix of numbers—rather than single numbers—because he viewed a particle's attributes as being inherently uncertain and indefinite. A particle is more like a smear in space than like a point on a line, he said, and so its position cannot be represented by discrete integers, but only by whole arrays of them. The different numbers of the array correspond to the different probabilities of a particle having those particular values.

Erwin Schrodinger, on the other hand, maintained that atomic states should be understood as waves of matter. An electron orbiting a nucleus, in his view, would not describe a smooth, circular pathway like a planet going around the sun, but would take a sinusoidal, roller-coaster ride around the atomic core. Other quantum particles would likewise be represented as waves, and their laws of motion would be expressed as wave equations.

At this point John von Neumann entered the fray and joined the two theories together. The key to it all was Hilbert space. Von Neumann showed that if atomic states were understood as vectors (or arrows) in infinitely dimensioned Hilbert space, then the arrows' rotations would correspond equally well to the numerical entries of Heisenberg's matrices and to the wave functions in Schrodinger's theory. Johnny worked all this out in a new axiomatic mathematical framework, one which made the apparently random behavior of quantum particles seem almost logical.

Having done all this by the age of twenty-six, von Neumann acquired an international reputation, and in the fall of 1929 Oswald Veblen, then still of Princeton University's mathematics department, invited Johnny to come to Princeton and give a series of lectures "on some aspect of the quantum theory." Von Neumann accepted, and after a short time in the country he decided that he and the United States were tailor-made for each other. Here was the land of optimism, pragmatism, and can-do. The people were outgoing, friendly, informal; best of all, they liked to have a good time, just like he did. Of course America did lack some of the old-world comforts, such as the cafes, the little bistros where you could sip espresso and smoke cigars and discuss

the status of the *Ergodic Theorem* for hours on end. For a while von Neumann thought about opening a European-style taverna in Princeton, but he never went through with the idea. He did do the next-best thing, however: he threw his parties. To hear Institute old-timers tell it, they were like small operettas.

"They were unbelievable," says one of von Neumann's old friends. "The stories you read about those parties, they're not exaggerations. Von Neumann was a fantastically witty person, a lusty person, he was fatter than I am. He knew how to have a good time." These evening affairs were held regularly, at least once a week, sometimes twice, at von Neumann's big white clapboard house at 26 Westcott Road, where uniformed servants used to come around with the drinks. There was dancing, smoke, loud laughter, and camaraderie. "Those old geniuses got downright approachable at the von Neumanns'," a friend remembers.

When the Institute for Advanced Study was getting underway at Princeton it was only natural that von Neumann should be invited to become a member, and so along with Einstein, Veblen, and Alexander, Johnny became an Institute professor. He was a youngster in a group of old men. "He was so young," says one Institute member, "that most people who saw him in the halls mistook him for a graduate student."\

At an Institute bristling with great intellects, von Neumann had the fastest mind by a large margin. "He had the kind of mind," says Julian Bigelow, who worked with him on the computer project, "that if you go in to see him with an idea, inside of five minutes he's five blocks ahead of you and sees exactly where it's going. His mind was just so fast and so accurate that there was no keeping up with him. There was nobody on earth, as far as I'm concerned, who was in his category."

Lots of mathematicians say that they aren't particularly good with numbers, that they can't add, subtract, multiply, or divide faster than anyone else. But von Neumann was a human adding machine. "When his electronic computer was ready for its first preliminary test," says Paul Halmos, one of Johnny's assistants at the Institute, "someone suggested a relatively simple problem involving powers of 2. (It was something of this kind: what is the smallest power of 2 with the property that its decimal digit fourth from the right is 7? This is a completely trivial problem for a present-day computer: it takes only a fraction of a second of machine time.) The machine and Johnny started at the same time, and Johnny finished first."

You had to be a very quick note-taker indeed if you were going to follow one of von Neumann's lectures. During his seminars (Fuld Hall's seminar room was right across the hallway from his office) he'd write dozens of equations on the blackboard, jamming them all into a two-foot square space off to one side. As soon as he was finished with one formula he'd zip it away with the eraser and replace it with another one. He'd do this again and again, one right after the other—an equation and zzzip, another one and zzzip—and before you knew it he'd be putting the eraser back on the ledge and brushing the chalk dust from his hands. "*Proof by erasure*," his listeners called it.

The man also had a true photographic memory, never forgot a thing. "As far as I could tell," says Herman Goldstine, "von Neumann was able on once reading a book or article to quote it back verbatim; moreover, he could do it years later without hesitation … On one occasion I tested his ability by asking him to tell me how the Tale of Two Cities started. Whereupon, without any pause, he immediately began to recite the first chapter and continued until asked to stop after about ten or fifteen minutes."

In the best supergenius tradition, von Neumann had his share of eccentricities. For one, he always dressed like a banker, no matter what the circumstances. He and his wife once went on a trip to Arizona, where they visited the Grand Canyon. Being a good-time boy, Johnny of course wanted to go down to the bottom, on one of those mule train rides. Everyone else was dressed *a propos* — short sleeves, chaps, cowboy boots, sombreros, and so on, but not von Neumann. Certainly not. He was up there on his horse or mule or whatever it was, in his standard white shirt and tie, suit jacket, and display handkerchief.

Apparently he believed in suffering for style. And then there was the matter of his developing the proper accent. Despite everything, von Neumann didn't want to be too American. "He pronounced 'integer' as 'integher,' Herman Goldstine explains—but every now and then he would say it right. "But then [he] quickly corrected himself and again said it in his own style."

And there were the absent-minded professorisms. Von Neumann's wife Klara recalled that once when she was sick, "I sent him to get me a glass of water; he came back after a while wanting to know where the glasses were. We had been in the house only seventeen years." (Well, they had servants. They knew this type of thing.) Another time Johnny drove out of Princeton one morning for an appointment in New York City. But halfway there he forgot who he was supposed to see, and so he phoned his wife wanting to know, "Why am I going to New York?" What a guy!

It was inevitable that the fastest mind in Western civilization should sooner or later meet up with "the electronic brain." The ENIAC —the *Electronic Numerical Integrator and Computer* — was being built in Philadelphia, just fifty miles down the road from Princeton. The convergence of these two number crunchers was one of those fateful world historical moments which resulted from a chance encounter between two men. The men were von Neumann and Herman Goldstine, both of whom were doing work for the US. Army's Ballistics Research Laboratory at the Aberdeen Proving Grounds, in Maryland. The ENIAC was being built for the Army, for whom it was going to calculate missile trajectories and firing tables like greased lightning. Goldstine used to shuttle back and forth between Aberdeen and Philadelphia,

and one day, in August 1944, while he was waiting for the train, who should wander up the station platform but John von Neumann.

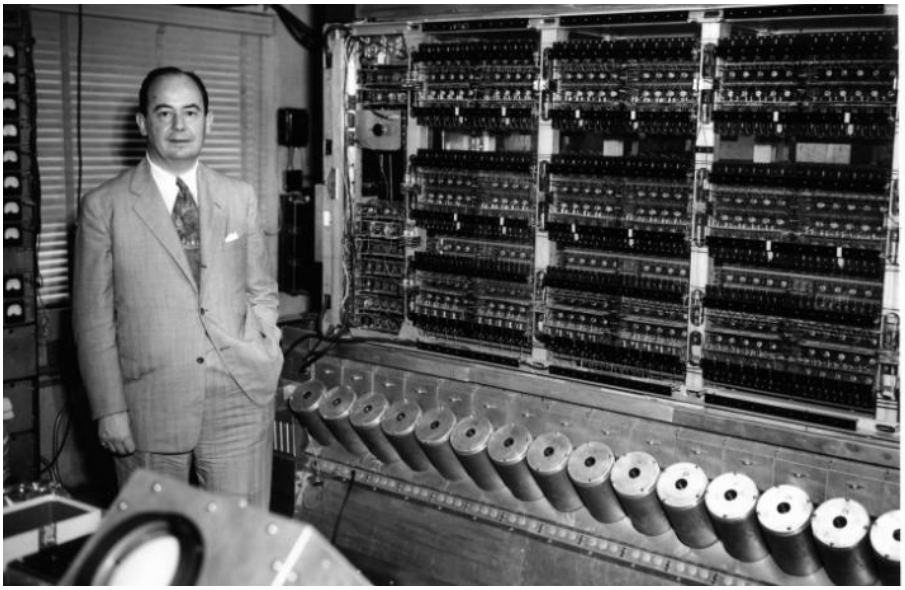
"Prior to that time I had never met this great mathematician," Goldstine remembers, "but I knew much about him of course and had heard him lecture on several occasions. It was therefore with considerable temerity that I approached this world-famous figure, introduced myself, and started talking. Fortunately for me von Neumann was a warm, friendly person who did his best to make people feel relaxed in his presence. The conversation soon turned to my work. When it became clear to von Neumann that I was concerned with the development of an electronic computer capable of 333 multiplications per second, the whole atmosphere changed from one of relaxed good humor to one more like the oral examination for the doctor's degree in mathematics."

A few days later von Neumann was in Philadelphia poring over what there was of the ENIAC. "At this period," Goldstine says, "the two accumulator tests were well underway. I recall with amusement Eckert's reaction to the impending visit. [J. Presper Eckert was, together with John Mauchly, the ENIAC's co-inventor.] He said that he could tell whether von Neumann was really a genius by his first question. If this was about the logical structure of the machine, he would believe in von Neumann, otherwise not. Of course, this *was* von Neumann's first query."

Six months after this first meeting between The Mind and The Machine, von Neumann was planning to build his own computer at the Institute for Advanced Study. First on the agenda, though, was to get a clear picture of the

ENIAC's drawbacks, of which there was no shortage. For one thing, it was too big. In fact it was worse than big, it was colossal, a veritable dinosaur of tubes and wiring. It was 100 feet long, 10 feet high, and 3 feet deep. It had over 100,000 parts, including 18,000 vacuum tubes, 1,500 relays, 70,000 resistors, 10,000 capacitors, and 6,000 toggle switches. There seemed to be no end to the thing, and von Neumann used to joke that just keeping it going was "like fighting the battle of the Bulge every day." When the machine once ran for five days without a single tube failing, the inventors were in hog heaven.

The ENIAC consumed so much power that, according to legend, every time it was turned on, the lights dimmed all over West Philadelphia. From a functional standpoint, though, the machine's size, failure rate, and power requirements were as nothing compared to the demands imposed by its relatively hard-wired programming. Unlike modern general-purpose computers which can switch from word processing, to graphics, to game playing at the flick of a floppy disk, the ENIAC had been designed primarily to do one thing, and that was to compute firing and bombing tables. Getting it to do anything else was a major production. Every time you wanted to give the machine a new type of problem, you had to go around resetting switches and re-plugging cables one at a time, all by hand. Since the machine had thousands of individual switches and hundreds of external cables and plugs, it could take up to two or three days for a couple of technicians to set up the ENIAC to run a problem that would take it only a matter of minutes to compute.



This way lay madness. There was an idea going around that would change the concept of a computer fundamentally, an idea now known as stored programming. Its origins are obscure. Some computer historians say that it came from von Neumann himself, others say Mauchly and Eckert, while still others trace it back to the British mathematician Alan Turing. (Von Neumann had met Turing at Cambridge University in the summer of 1935, and later Turing came to Princeton to get his Ph.D. Von Neumann offered the younger man a post at the Institute as his research assistant, but Turing declined this in favor of returning to Cambridge.) But wherever it came from, von Neumann seemed to be the one who took the idea of stored programming and transformed it into a working system. His idea was to put the machine's programming inside the machine, not in the form of internal wiring, but rather in the form of electrical charges and impulses. This would be an advantage because it would allow you to control and alter the machine's operations without repositioning its external wiring, switches, and connections.

The concept of a machine being controlled from the inside, however, ran against conventional wisdom and common sense. Machines had always been controlled from the outside, by means of knobs, levers, buttons, and so on. Even machines that were programmed, like the Jacquard loom, were controlled by physical objects—punchcards or tapes— that were outside of, and often physically separate from, the machine itself. To argue—as von Neumann did—that a machine could be controlled from the inside by impalpable electrical impulses, this required a major leap of the intellect.

Von Neumann decided that the basic functions of a computer— addition, subtraction, and so forth—could be hardwired into the machine, made a part of its physical structure. But the order and combinations in which it would perform the functions, these things could be soft wired. To get a machine to work different problems, you wouldn't have to run around throwing switches and re-plugging cables. You wouldn’t have to change the machine. You'd leave the machine as it was and simply change its instructions. "Once these instructions are given to the device," von Neumann said, it would "carry them out completely and without any need for further intelligent human intervention." In goes the problem, out comes your answer. No muss, no fuss.

In the spring of 1946 Johnny got serious about building a computer of his own at the Institute for Advanced Study. There were only two obstacles: money, and the approval of the Institute's faculty. The money was the easy part. The hard part was getting the Institute regulars to let him build a machine on their hallowed grounds. Even in the School of Mathematics itself, the computer project was not what you could call a big hit.

The School called a meeting to discuss the problem and, according to the minutes, "The discussion considered the effect of such activities upon the progress of mathematics and upon the general atmosphere of the Institute. The personal views expressed ranged from that of Professor Siegel, who, in principle, prefers to compute a logarithm which might enter into his work rather than to look it up in a table, through that of Professor Morse who considers the project inevitable but far from optimum, to that of Professor Veblen who simplemindedly welcomes the advances of science regardless of the direction in which they seem to be carrying us." (The minutes were taken by Veblen himself, who was known to slip in an acerbic comment or two.) Einstein didn't seem to care one way or another—a computer, he joked, wouldn't bring him any closer to a unified field theory.

Faculty members in other departments, such as the School of Humanistic Studies, were even less receptive. Even today, some of the school's old-line members are aghast at the very idea of *building something* at the Institute for Advanced Study. Harold Cherniss, a specialist in ancient Greek philosophy, became an Institute professor in 1948, when the machine was already under construction. "When you look back," Cherniss says today, "there are obviously strong arguments in favor of building the machine. But I still would have been against it. The computer had nothing to do with the purpose for which the Institute was founded. The computer was a practical venture, but the Institute is not supposed to be *practical*."

Frank Aydelotte, on the other hand, who had by now taken over the reins from Abraham Flexner, was quite ready to take the Institute off in more practical directions. This has happened again and again over the years. It's as if, in spite of their lofty position at the throne of the Platonic Heaven, the Institute's directors don't really feel deep down in their bones that it's altogether healthy for such a large bunch of people to be doing nothing but sitting around thinking.

Aydelotte, at any rate, told his board of trustees that, no matter how messy-handed it all might be, the computer project was one thing the Institute ought not to pass up. "I think it is soberly true to say," he said at a trustee meeting, "that the existence of such a computer would open up to mathematicians, physicists and other scholars areas of knowledge in the same remarkable way that the two-hundred-inch telescope [at Mount Palomar, then under construction] promises to bring under observation universes which are at the present moment entirely outside the range of any instrument now existing/' The computer would be a physical thing, true enough, but we can build it here anyway because its justification is theoretical. "It seems to me," he said, "very important that the first instrument of this quality should be constructed in an institution devoted to pure research."

Well, how could anyone resist? Here was the fastest mind in western civilization, the man to whom neuron and diode were on speaking terms, asking for a mere $100,000 so that he could get on with his work. Von Neumann was already thinking about the relation between mechanical and biological brains, and who could tell what might emerge from this? And of

course there was the not inconsiderable fact that the man behind it all would be none other than our very own good-time Johnny.

So they gave him his $100,000. But that wasn't all. The Radio Corporation of America came in with more money, and so did the Army Ordnance Department, and the Office of Naval Research and Development, and the Atomic Energy Commission. Money was no problem; in fact, compared to gaining the support of the Institute faculty, getting the money was kid stuff.

A year and a half after von Neumann and Goldstine met on the Aberdeen railway station, Johnny was hiring staff for the ECP: the Electronic Computer Project of the Institute for Advanced Study. He had already gotten Goldstine to leave the ENIAC project and come to the Institute. Then he got Arthur Burks. Burks was a rare man, a Ph.D. in philosophy who also understood electrical circuitry. But in addition there had to be the people who would actually build the thing—with their hands. Von Neumann would supply the grand ideas, the goals, the general design principles, but wielding a solder gun was clearly not part of his repertoire. He needed a chief engineer.

M.I.T. mathematician Norbert Wiener recommended Julian Bigelow. Bigelow had an electrical engineering degree and had worked for a while for IBM, and then came to M.I.T. during the war years to work as Wiener's assistant. Wiener and Bigelow were designing an automatic aiming mechanism for anti-aircraft guns. The core of the thing was a data processor that would collect information on the aircraft's flight path and then make a projection about how to aim the gun. If everything worked correctly, the shell

and the plane would arrive at the same place at the same time, producing a splendid *auto-da-fe*.

In January 1946 Bigelow came down to Princeton for an interview with von Neumann. He was a couple of hours late. Bigelow was driving down from Massachusetts in the little 1937 Willys he had at the time, but the car wasn't in the best shape and required frequent on-the-road tweaking and adjustments to keep it going. Finally, just as von Neumann was about to give up hope, a decrepit vehicle pulls up to the front of his house and dies amid several noisy backfires. Julian Bigelow got out of the car and walked up to the house.

"Von Neumann lived in this elegant lodge house on Westcott Road in Princeton," Bigelow says. "As I parked my car and walked in, there was this very large Great Dane dog bouncing around on the front lawn. I knocked on the door and von Neumann, who was a small, quiet, modest kind of a man came to the door and bowed to me and said, 'Bigelow, won't you come in,' and so forth, and this dog brushed between our legs and went into the living room. He proceeded to lie down on the rug in front of everybody, and we had the entire interview—whether I would come, what I knew, what the job was going to be like—and this lasted maybe forty minutes, with the dog wandering all around the house. Towards the end of it, von Neumann asked me if I always traveled with the dog. But of course it wasn't my dog, and it wasn't his either, but von Neumann—being a diplomatic, middle-European type person—he kindly avoided mentioning it until the end."

Von Neumann told Bigelow that he wanted to build an entirely new computer, a very high-speed, truly general-purpose, stored-program machine. "To begin with," Bigelow says, "it would be parallel, it would be stored-program, it would be very simple in that it would have a small number of arithmetic operations—addition and subtraction—which it could do very rapidly. Von Neumann felt that these would do the whole job since you could program multiplication and division out of conditional add subtracts. The idea was to get the thing running as fast as possible, get it as high-speed as you can, and then the programming will take care of the rest. Von Neumann described the kinds of speeds he wanted to get—bit transfers in a microsecond or so. But in the end he came around to thinking that it might be more efficient to program multiplication in too."

The computer began in the basement of Fuld Hall, in the boiler room, in June 1946, and soon von Neumann, until then a mathematical physicist, was up to his ears in electronics and writing letters that said things like:

> "There exist two recent (1944) midget pentodes which may be of interest to us: 6AK5 and 6AS6 … Both have sharp cut-off on the control grids. 6AK5 has inner connection between supressor and cathode; 6AS6, however, brings the supressor out separately and has a sharp cut-off on the supressor too: — 15v for 4- 150v on the screen."

The Institute wanted to put the project into a separate building, to get it out of sight and out of mind of the Institute regulars, but there was a problem about getting permission from the city. After all, this was a residential

neighborhood, one of the richest and most exclusive in Princeton, and the good burghers didn't like the idea of a machine shop—"a computer factory"—springing up in their back yards. So there was a town meeting. "And there was this idiot from RCA Laboratories, with a Ph.D. in chemistry, no less, and he got up in that town meeting and said that we don't want the building down there because it would make too much noise. *But you couldn't have heard it*," Bigelow says. "If you were standing in the street outside *you could not tell if* we were in there building the machine that day or not."

The engineers spent a year in the boiler room, making their test apparatus and designing the prototype. By January 1947 the Institute had gotten the city's permission to put up the new building, and the structure was going up across the campus. It was a large, plain, one-story building, not in the Georgian style at all, and separated from the rest of the Institute by space, design, and atmosphere. The computer crew moved into the ECP building that summer.

The prototype worked the first time out. "It worked so well," Bigelow says, "that when we first turned it on it didn't need any adjustments or trimming." Then they laid out the complete 40-stage unit. "Von Neumann would put half-finished ideas on the blackboard and Goldstine would take them back down and digest them and make them into something for the machine. On the other hand, von Neumann often had only the foggiest ideas about how we should achieve something technically. He would discuss things with me and leave them completely wide open, and I would think them over and come back with an experimental circuit, and then my group would test it out."

Although the I.A.S. machine was a stored-program computer, its programs were not written in any of today's high-level languages, like BASIC or Pascal. They were written directly in machine language, composed of long strings of ones and zeroes. To get the machine to do what could be done on a modern computer today simply by pressing the backspace key required entering a machine-language phrase on the order of 1110101. "There was no assembly language, even," Bigelow says, "none of the tricks that we now have. This was a case where von Neumann was so clever technically that he had no problem with it. And he couldn't imagine anyone else working with a computer who couldn't program in machine code."

To add insult to injury here in this realm of peaceful contemplation, the machine's shakedown test was not something innocuous like running a program for finding the first 5,000 prime numbers. Oh, no. It would be nothing so harmless and prosaic. Von Neumann was involved in H-bomb work at Los Alamos—many of the offices in the ECP building were put there specifically for the use of visiting Los Alamos scientists—and Johnny had the idea that one of the calculations needed for the thermonuclear reaction should be tried on the I.A.S. computer. The computation required was monumental, the largest ever done up to that time, by man or machine, taking more than a billion elementary arithmetical and logical operations just to find out whether the reaction would propagate as desired. So the first problem was to figure out whether the H-bomb would explode. The answer was yes.

"It was computed in the summer of 1950 by Marshall Rosenbluth," Bigelow says, "while the machine had clip leads on it. We had engineers there to keep

it running and it ran for 60 days, day and night, with very few errors. It did a nice job. And it was a very historic computation."

Later, of course, when the Institute formally unveiled its computer, in June of 1952, the demonstration problem was one that would be acceptable to any pure mathematician. It dealt with Rummer's conjecture, a problem in prime number theory. To celebrate the unveiling, von Neumann gave yet another party. There in the von Neumann living room was a scale model of the Institute for Advanced Study computer. It was sculpted in ice.

Von Neumann's machine was fully automatic, digital, and all purpose. It was a stored program computer whose inner architecture became the standard for a later generation of commercial machines. By any practical measure—not the yardstick to be applied at the Institute, of course!—von Neumann's computer project was a walkaway triumph. While the machine was operating it worked on problems in abstract mathematics, in physics, and in numerical meteorology. It did computations on the internal structure of stars, and on the stability of orbits in particle accelerators. It was a true all-purpose machine.

More important than the individual problems it worked, the von Neumann computer was the occasion for a vast outpouring of papers from the Institute, pioneering works on the theory and practice of machine computation. There was von Neumann's "First Draft of a Report on the EDVAC," which contained the first detailed description of a universal stored-program computer. There was the three-part "Planning and Coding Problems for an Electronic Computing Instrument," written with Goldstine and Burks. Here was the

notion of flow-charting, and machine-language programming. To foster the spread of knowledge, the authors intentionally refrained from copyrighting any of these papers, nor did they patent the machine itself. Von Neumann and his colleagues did the brainwork and experimental testing and then, in the traditional style of academic scientists, made their results freely available to any and all others.

Because the machine was new, and because Institute members didn't know how to exploit its capabilities, other Institute scientists didn't think much of the new electronic brain sitting in their own back yard. "There was never anything that we needed a lot of computing for," mathematician Deane Montgomery says. But above all there was this feeling that the genuine Platonic-heavenly scientist shouldn't be involved with *mechanisms*. "The snobs at our Institute," Freeman Dyson says, "could not tolerate having electrical engineers around them who sullied with their dirty hands the purity of our scholarly atmosphere."

There were people from the outside, of course, who were ready to pay for computer time, but Institute regulars regarded this as an absolute no-no. "We were not supposed to take outside contracts," Julian Bigelow says, "because they would be in some sense corrupting. And so we couldn't operate the machine. Finally it was taken over by Princeton University and operated by them for another three years."

In the late 1950s, after von Neumann died, faculty members and Institute trustees organized a committee to terminate the computer project. They held

hearings on it, at the director's house, right in Oppenheimer's living room. "This was back when the Institute used to do things right," Harold Cherniss says. "Everything was informal."

The committee called people to testify, but it was all low-key, like the officers of a gentleman's club making a change in the bylaws. So Herman Goldstine came to Olden Manor and allowed as how the computer was no longer a research tool, that it was now ready for commercial development. Other people came in and told the same story, and at length the scholarly gentlemen decided to close down the whole project. "But we passed a more general motion," Harold Cherniss says. "It was a declaration to have no experimental science, no laboratories of any kind at the Institute." And so it has been ever since. The Platonic-heavenly fathers had triumphed. Or as Freeman Dyson puts it, "The snobs took revenge."

When von Neumann's unlamented computer was retired, in 1958, it went to the Smithsonian Institution, where it's now on public display. At the Institute for Advanced Study, by contrast, ECP room #1, where the computer was put together, is not treated as a historical site. No plaque or bust commemorates the birth of the stored program computer within. The room, at the end of a dark and lonely hallway, today houses the Institute's stationery supplies, and boxes of file folders, pads of paper, and interdepartmental mail envelopes reach almost to the ceiling. It might be thought poetically just that the room is also stacked high with that inescapable artifact of the computer revolution, data-processing paper, but the Institute's best monument to von Neumann is elsewhere, in the offices of John Milnor whose investigations of the

Mandelbrot set would not be possible without the computer, and in the offices of Stephen Wolfram, whose computer simulations of cellular automata owe a lot to the mind and work of goodtime Johnny.

At Los Alamos during the war years, it seemed that half of the world's top scientists could be found at the frequent dinner parties that took place at this secret city in the New Mexico mountains. At one of these affairs, when the conversation turned to the topic of extraterrestrials, to the possibility of intelligent life elsewhere in the universe, Enrico Fermi asked a famous question. If these extraterrestrials really existed, then he wanted to know just one thing: "Where are they?" The universe has existed for billions of years, he reasoned, long enough for many waves of extraterrestrial colonization to have reached planet Earth. The invaders should be here, all around us, perhaps even forcing us to do their bidding. But they're not. So, if they really and truly do exist, then … Where are they?

Dyed-in-the-wool believers in extraterrestrial intelligence have a perfectly good answer to this, of course. The ETs are home where they belong, just like we are. Frank Drake, for example, one of the founders of the SETI movement

(the *Search for Extraterrestrial Intelligence*), says that aliens have decided that interstellar journeys are not worth the effort, and so they "are living comfortably and well in the environs of their own star."

Lately, though, the ET skeptics have rallied back with a new Fermi-type question: If there really are all these aliens spread throughout the universe, then: "*Where are their von Neumann machines*?" After all, a von Neumann machine is a self-reproducing universal constructor, a robot that makes copies of itself from whatever raw materials lie ready to hand—or to forceps, as the case may be. To reach other civilizations, all an intelligent species would have to do is to send out a small initial force of von Neumann machines, and these would sooner or later propagate, proliferate, and control the rest of space. "The key point," says mathematician Frank
Tipler, "is that, once a von Neumann machine has been sent to another solar system, the entire resources of that solar system become available to the intelligent species which controls the von Neumann machine; all sorts of otherwise-too-expensive projects become possible." But we *don't* find extraterrestrial von Neumann machines invading downtown Dallas or Chicago, and so it's a good bet that there are no ETs out there after all.

It's a tribute to the care with which von Neumann described these "von Neumann machines," the self-reproducing robots that he conceived of, that today no mathematician or physicist doubts that they are theoretically possible. But why is this? Why are physicists and mathematicians, who are usually a conservative lot and not much given to daydreaming, why are they unanimously willing to entertain the proposition that brute machines,

unfeeling creatures of meshing gears and cold steel, may somehow be able to engage in the process of self-reproduction?

The fact of the matter is that the idea of self-replicating machines is not really all that new to begin with. Rene Descartes, the seventeenth-century French mathematician and philosopher, maintained that animals are in effect no more than machines, and that people are just machines that have God-given souls in them. According to Descartes, there is nothing mystical or ineffable about humans or animals, at least so far as their bodies are concerned: bodies are simply physical systems which operate according to natural laws, just like everything else in the universe. Man's body, Descartes said, is "a machine which, having been made by the hands of God, is incomparably better arranged … than any of those which can be invented by man."

Descartes's view goes by a number of names: materialism, reductionism, mechanism, determinism. Underlying them all is the principle that everything in the universe—that is, every physical thing; imponderable entities like souls and spirits are another matter altogether—everything can be reduced to the operations of matter and motion. "All natural phenomena,"

Descartes said, "can be explained in this way; I therefore do not think any other principles in physics are either necessary or desirable." Taken to its limits as a philosophy of science, the matter-and-motion view represents the extreme of optimism as regards man's ability to know nature. It's the view that once we understand the interplay of the atoms in their finest details, we'll know all there is to know, there will be nothing left over to elude the grasp of

human reason, nothing mysterious lurking behind the phenomena, nothing hidden, *nothing left dangling*. There are no unseen spirits, occult life forces, or baffling animating vapors that can be comprehended only by intuition or a revelation from God on high. Mysticism dies a soggy, well-deserved death, and the universe is declared open for knowledge, utterly transparent to the human mind.

Call it immodest, arrogant, or what you will ("the epitome of hubris," perhaps?), such a viewpoint is basic to all of science. There's no way that a working scientist is going to spend a lifetime beating his brains out against the phenomena, trying to figure things out, if he's convinced deep down inside that nature, at bottom, is arbitrary and incomprehensible. "*I should not want to be forced into abandoning strict causality,*" Einstein once said. "*In that case, I would rather be a cobbler, or even an employee in a gaming-house, than a physicist*."

Well then ... if nature is open to our inspection, if there's nothing mysterious about the way things work, then why indeed shouldn't a machine be able to reproduce? Why shouldn't we be able to figure out how nature reproduces animals' bodies, and then go ahead and copy the process using man-made machines? Cells make cells, human bodies make human bodies, so why not … machines that make machines?

In June of 1948, while his electrical engineering staff was building a flesh-and-blood computer across the campus, John von Neumann gave a series of three lectures in Princeton on the subject of self-reproducing machines. (Here

we have the basic ingredients of a mathematical-genius-run- amok scenario: With his subordinates putting together an electronic brain in the computer lab, the mad scientist himself, hair standing on end, lays plans for a race of self-replicating monsters that will take over the planet. It wasn't like this, of course ... but on the other hand it was only a short while after von Neumann's lecture that another mathematician, Frank Tipler, had his visions of extraterrestrial von Neumann machines overrunning the galaxy.)

After the Princeton talks, von Neumann gave expanded versions of the lectures elsewhere. He wrote up some of his discoveries, but died before he put his full theory into final form. Later Arthur Burks, who had worked on the ENIAC and the I.A.S. computers, edited and completed Johnny's work on automata, and published the result as Theory of Self- Reproducing Automata. Almost certainly his most brilliant and original achievement in science, automata theory linked together von Neumann's work in logic, computers, and neurophysiology, and showed how the most basic property of life, reproduction, can be accomplished by simple mechanics.

The self-reproducing mechanisms that von Neumann invented are not creatures of the real world; they're abstractions: idealized, conceptual fictions that exist only in the imagination or on paper. Nevertheless, these abstractions contain the basic plan for machine self-reproduction.

"Now one has to be careful what one means by this," von Neumann said. "There is no question of producing matter out of nothing." Rather, he said, we have to think of machine replication along the lines of how animals, plants,

and individual cells produce their offspring. They don't reproduce themselves ex nihilo, they utilize the raw materials in their environments, and the same must be true of machines. They'll have to have a ready supply of parts.

"Imagine," von Neumann said, "that there is a practically unlimited supply of these parts floating in a large container. One can then imagine an automaton functioning in the following manner. It is also floating around in this medium; its essential activity is to pick up parts and put them together, or, if aggregates of parts are found, to take them apart." This sea of machine parts is the mechanical equivalent of the earth's original primordial soup.

All earthly organisms have arisen through chains of evolutionary development that are quite random and accidental. There's nothing fated or necessary about the particular animals that exist here now: if the earth's initial conditions had been different, or if different mutations had occurred, then different species would exist from the ones that are here now. Von Neumann, by contrast, wanted to know what were the mechanisms that would have to be present for any evolution of any type to occur. He wanted to find the minimum necessary self-reproductive baggage, the Platonic archetype of genesis, as it were. And no miracles allowed: only matter in motion.

In his Institute lectures, von Neumann claimed that a self-replicating machine would have to have at least eight different kinds of parts, four for the brains, four for the brawn. The "brains" would be composed of organs that respond to different types of incoming stimuli. For example, if two stimuli occur together—for example if two necessary parts bump into the organism at the

same time—the machine will have to know about this, and so it will have to have a sense organ that responds to and is aware of two or more simultaneous incoming messages. If the automaton— the robot—is being bombarded by all kinds of stimuli at the same time while it needs to be aware of only one of them, then it will have to have a faculty that can select out what it needs. In addition, it will need a sort of clock, an organ that can coordinate the actions of all the other parts.

As far as its body is concerned, a self-replicating machine would need an Archimedean point, something that will remain stationary with respect to something else. Call this a rigid member, or girder. Put one or more such together and you'll have the automaton's skeleton, its very bones. The skeleton could be internal, like man's, or external, like a lobster's, it makes no difference. The point is that it has to have some rigidity.

If the robot needs to put two things together that are floating around in the parts sea, it will have to have a fusing organ. By the same token, it will have to have something that will separate two or more things that are already connected together, so there will have to be a cutting organ as well. And then the robot will need something to make all these organs move, some "muscles."

There's no way to know, of course, what such a self-reproducing mechanism would look like, although it's easy enough to dream up any number of cute and cuddly little self-reproducers.

As for the process of self-reproduction, suppose, von Neumann said, that floating around in the parts sea are two choice girders, and that the robot—also bobbing around in there—needs those girders in order to make a copy of itself. Suppose further that the girders bump into the robot's sensing organ, after which the robot connects them. It does this again and again, according to a plan, and soon there's a skeleton arising, where before there was only an assorted collection of parts. But where does the robot's "plan" come from?

Well, since the robot has sensing organs, it could learn the structure of some object—including itself—by touching it, and then recording the essentials of that structure in some kind of code. Later on, it could use that same code as a blueprint for making another version of the object in question. As for the code, von Neumann used a device of Alan Turing, who had discovered that any set of plans or instructions could be expressed in a binary notation, which is to say, a simple string of ones and zeroes. So von Neumann proposed that his automata use a binary code, and he went on to show how to make such a binary "tape" out of the rigid girders floating around in the environment sea. The machine would take a bunch of girders and connect them up to form a saw tooth chain: /\/\/\/\. At each intersection it would then either insert a vertical girder, to stand for a 1, or leave the intersection blank, to stand for a 0. The code "word" 010011, for example, would be represented by:/\/|\/\/\/|\/|\.

Once it had the structure of some object encoded in a "blueprint," it would be a simple matter for the automaton to duplicate the object that the code described. It would read the blueprint off the binary tape, select out the

necessary elements from the surrounding parts sea, and then put them together according to the blueprint. The result would be a perfect copy of the object.

This would not be sd/-reproduction, of course, unless we imagine that the automaton had learned its own structure and encoded that into a blueprint, but there is no obstacle in principle to the robot's doing this.

Self-reproduction, then, can occur in the following way. First of all there are the givens: the automaton itself, the parts sea, and the blueprint. In addition, there's a mechanism that will make a copy of the blueprint, and, finally, there's a controller organ, which will direct all the operations and get them done in the proper sequence. Then the process begins. Following the blueprint, the robot takes what it needs from the parts sea—rigid beams, parts of muscles, random organs, and so on—joins some things together, and cuts other things apart. It arranges girders, organs, and whatnot, according to the blueprint, so that the structure of the object exactly matches its own structure. In the final step, the robot makes a copy of its own blueprint and attaches it to its offspring, leaving at the end an exact copy of the parent robot. Machine self-reproduction has occurred.

The strange thing about all of this was that, in figuring out how self-reproduction *had* to occur, von Neumann had hit upon the very way Mother Nature herself had accomplished the task. Von Neumann had worked out his abstract analysis of machine reproduction by December of 1949, four years prior to Francis Crick's and James Watson's explanation of the workings of

the DNA molecule. It turns out that DNA molecules reproduce themselves precisely as von Neumann said any self-replicating machine would have to.

As Freeman Dyson has explained in his autobiography, *Disturbing the Universe*, "now every child learns in high school the biological identification of von Neumann's four components." The automaton itself, which does the work of replication, corresponds to the cell's ribosomes, the particles which translate the genetic information into molecules of protein. The copying mechanism, the part of the robot that makes a copy of its own blueprint, corresponds to RNA and DNA polymerase, the substances that combine nucleotides (rigid girders) into long chains of nucleic acids (the binary-tape blueprint). The controller, which directs the robot's operations, corresponds to the repressor and derepressor molecules that regulate gene development, causing different cells to develop in different ways. And finally there's the blueprint itself, containing in binary code the robot's own structure. This corresponds to the genetic materials themselves, DNA and RNA, which contain the genetic code.

"So far as we know," says Dyson, "the basic design of every microorganism larger than a virus is precisely as von Neumann said it should be."

Von Neumann even went on to explain how evolution can occur as machines reproduce. An increase in complexity can occur, he said, when an automaton's blueprint undergoes some kind of an alteration. Suppose, for example, that an automaton floating in the parts soup happens to bump into a rigid girder that's bobbing around next to it. If the girder hits the automaton just right, the

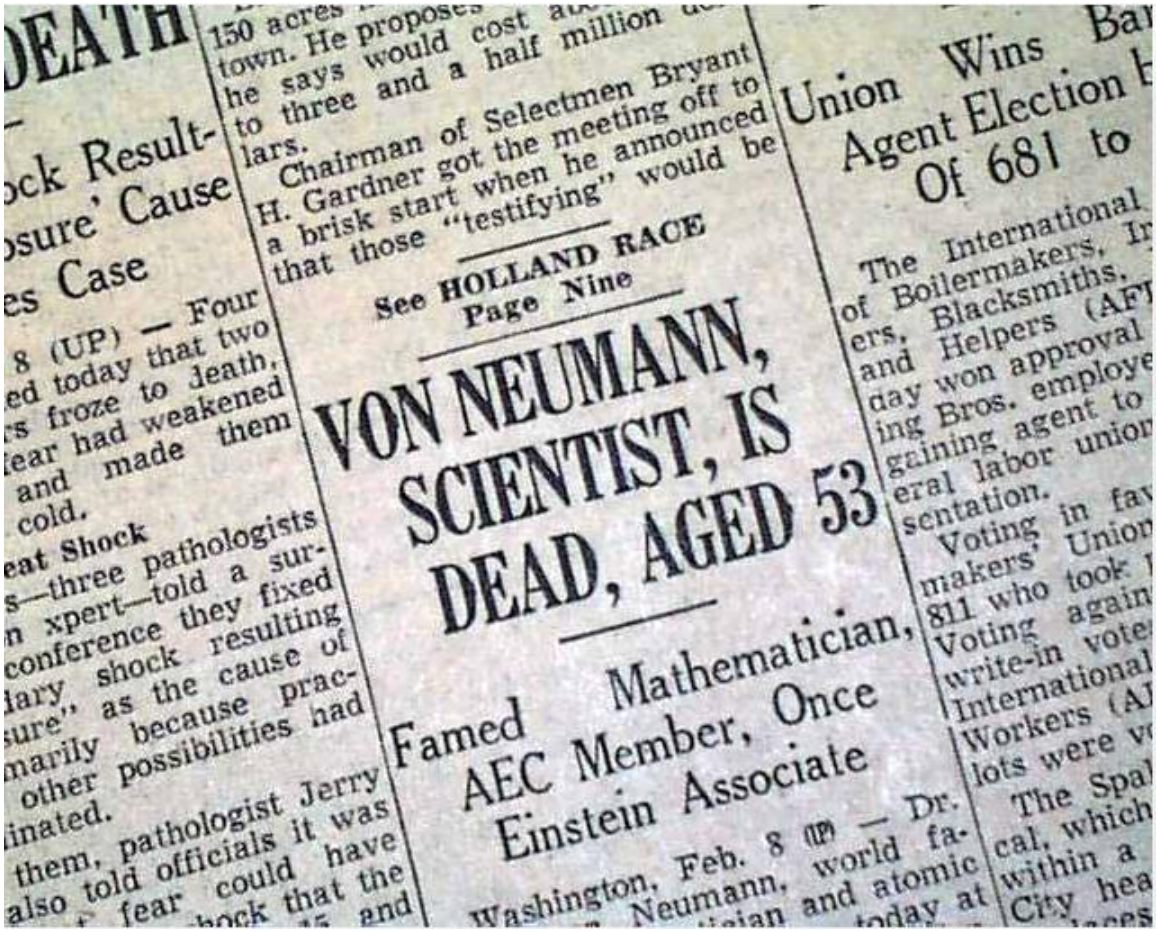
collision may change a portion of its blueprint. Then, when it comes time to reproduce, the automaton will give birth, not to itself, but to a modified version of itself. A mutation will have occurred, and in this way fairly primitive automata—ones corresponding to the complexity of an amoeba, for example—can over the course of time give rise to other entities that are comparatively sophisticated—like man. Artificial automata can evolve just as natural automata do, that is to say, just as animals have evolved. Complexity itself is the deciding factor. Below a certain minimum level of complexity, reproducing automata will degenerate into simpler mechanisms. But above that level, he says, "the phenomenon of synthesis, if properly arranged, can become explosive." A race of metal men could arise from a collection of nuts, bolts, and other parts bumping around in a primordial automata soup. John von Neumann, the Charles Darwin of the robots.

Von Neumann's analysis of "kinematic" or moving, three-dimensional automata, was not, by far, his last word on automata theory. In fact, it was only the beginning. Stanislaw Ulam, a colleague of von Neumann's at the Institute, and later on at Los Alamos, had once suggested that Johnny investigate an abstract, two-dimensional, checkerboard-like framework for automata. Ulam had used such a system of granular or "cellular" spaces to study the growth of crystals, and later von Neumann investigated whether an indefinitely large two-dimensional cellular space might not be enough of an environment for cellular automata self-reproduction. In the process of answering the question—in the affirmative—von Neumann created another whole branch of mathematics, cellular automata theory.

This was von Neumann's most abstract, high-up, Platonic-heavenly theory of them all. These logical entities, defined by mathematical functions alone, live, die, and reproduce in a vast, abstract, two-dimensional arrays of imaginary spaces. With the right functions programmed into them, the march of cellular automata across this abstract gridwork will approximate the evolution and development of the physical systems in nature.

As outlandish as the notion of self-reproducing two-dimensional cellular automata may have been, these entities were quite acceptable to the other members of the Institute for Advanced Study. Cellular automata were, after all, only *abstractions*—Platonic archetypes—and these are what the Institute is all about. It turned out, however, that cellular automata do have a real-world significance. Just as von Neumann's three-dimensional robots elucidated the process of self-replication in living organisms, a later member of the Institute, Stephen Wolfram, would argue that von Neumann's automata have a wide and deep significance for the understanding of nature, that in fact they may be the same type of mathematical mechanisms that give rise to the complexity of the universe. The inner operations of cellular automata, he says, constitute a kind of "natural software." Whether or not he's right about this, what's absolutely certain is that Wolfram could never have advanced his argument without the aid of the instrument that John von Neumann had played a pivotal role in developing, the electronic digital computer.

Pictorial: Newspaper report … Von Neumann is Dead, Aged 53



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See HOLLAND RACE
Page Nine

VON NEUMANN, SCIENTIST, IS DEAD, AGED 53

Famed Mathematician, AEC Member, Once Einstein Associate

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Can We Survive Technology by John von Neumann (1955)

"The great globe itself" is in a rapidly maturing crisis —a crisis attributable to the fact that the environment in which technological progress must occur has become both undersized and underorganized. To define the crisis with any accuracy, and to explore possibilities of dealing with it, we must not only look at relevant facts, but also engage in some speculation. The process will illuminate some potential technological developments of the next quarter-century.

In the first half of this century the accelerating industrial revolution encountered an absolute limitation—not on technological progress as such but on an essential safety factor. This safety factor, which had permitted the industrial revolution to roll on from the mid-eighteenth to the early twentieth century, was essentially a matter of geographical and political *Lebensraum*: an ever broader geographical scope for technological activities, combined with an ever broader political integration of the world. Within this expanding framework it was possible to accommodate the major tensions created by technological progress.

Now this safety mechanism is being sharply inhibited; literally and figuratively, we are running out of room. At long last, we begin to feel the effects of the finite, actual size of the earth in a critical way.

Thus the crisis does not arise from accidental events or human errors. It is inherent in technology's relation to geography on the one hand and to political

organization on the other. The crisis was developing visibly in the 1940's, and some phases can be traced back to 1914. In the years between now and 1980 the crisis will probably develop far beyond all earlier patterns. When or how it will end—or to what state of affairs it will yield —nobody can say.

Dangers – Present and Coming

In all its stages the industrial revolution consisted of making available more and cheaper energy, more and easier controls of human actions and reactions, and more and faster communications. Each development increased the effectiveness of the other two. All three factors increased the speed of performing large-scale operations —-industrial, mercantile, political, and migratory. But throughout the development, increased speed did not so much shorten time requirements of processes as extend the areas of the earth affected by them. The reason is clear. Since most time scales are fixed by human reaction times, habits, and other physiological and psychological factors, the effect of the increased speed of technological processes was to enlarge the *size* of units — political, organizational, economic, and cultural — affected by technological operations. That is, instead of performing the same operations as before in less time, now larger-scale operations were performed in the same time. This important evolution has a natural limit, that of the earth's actual size. The limit is now being reached, or at least closely approached.

Indications of this appeared early and with dramatic force in the military sphere. By 1940 even the larger countries^ of continental Western Europe

were inadequate as military units. Only Russia could sustain a major military reverse without collapsing. Since 1945, improved aeronautics and communications alone might have sufficed to make any geographical unit, including Russia, inadequate in a future war. The advent of nuclear weapons merely climaxes the development. Now the effectiveness of offensive weapons is such as to stultify all plausible defensive time scales. As early as World War I, it was observed that the admiral commanding the battle fleet could "lose the British Empire in one afternoon/' Yet navies of that epoch were relatively stable entities, tolerably safe against technological surprises. Today there is every reason to fear that even minor inventions and feints in the field of nuclear weapons can be decisive in less time than would be required to devise specific countermeasures. Soon existing nations will be as unstable in war as a nation the size of Manhattan Island would have been in a contest fought with the weapons of 1900.

Such military instability has already found its political expression. Two superpowers, the U.S. and U.S.S.R., represent such enormous destructive potentials as to afford little chance of a purely passive equilibrium. Other countries, including possible "neutrals," are militarily defenseless in the ordinary sense. At best they will acquire destructive capabilities of their own, as Britain is now doing. Consequently, the "concert of powers"— or its equivalent international organization—rests on a basis much more fragile than ever before. The situation is further embroiled by the newly achieved political effectiveness of non-European nationalisms.

These factors would "normally"—that is, in any recent century—have led to war. Will they lead to war before 1980? Or soon thereafter? It would be presumptuous to try to answer such a question firmly. In any case, the present and the near future are both dangerous. While the immediate problem is to cope with the actual danger, it is also essential to envisage how the problem is going to evolve in the 1955-80 period, even assuming that all will go reasonably well for the moment. This does not mean belittling immediate problems of weaponry, of U.S.-U.S.S.R. tensions, of the evolution and revolutions of Asia. These first things must come first. But we must be ready for the follow-up, lest possible immediate successes prove futile. We must think beyond the present forms of problems to those of later decades.

When Reactors Grow Up

Technological evolution is still accelerating. Technologies are always constructive and beneficial, directly or indirectly. Yet their consequences tend to increase instability— a point that will get closer attention after we have had a look at certain aspects of continuing technological evolution.

First of all, there is a rapidly expanding supply of energy. It is generally agreed that even conventional, chemical fuel—coal or oil—will be available in increased quantity in the next two decades. Increasing demand tends to keep fuel prices high, yet improvements in methods of generation seem to bring the price of power down. There is little doubt that the most significant event affecting energy is the advent of nuclear power. Its only available controlled source today is the nuclear fission reactor. Reactor techniques appear to be

approaching a condition in which they will be competitive with conventional (chemical) power sources within the U.S.; however, because of generally higher fuel prices abroad, they could already be more than competitive in many important foreign areas. Yet reactor technology is but a decade and a half old, during most of which period effort has been directed primarily not toward power but toward plutonium production. Given a decade of really large-scale industrial effort, the economic characteristics of reactors will undoubtedly surpass those of the present by far.

Moreover, it is not a law of nature that all controlled release of nuclear energy should be tied to fission reactions as it has been thus far. It is true that nuclear energy appears to be the primary source of practically all energy now visible in nature. Furthermore, it is not surprising that the first break into the intranuclear domain occurred at the unstable "high end" of the system of nuclei (that is, by fission). Yet fission is not nature's normal way of releasing nuclear energy. In the long run, systematic industrial exploitation of nuclear energy may shift reliance onto other and still more abundant modes. Again, reactors have been bound thus far to the traditional heat-steam-generator-electricity cycle, just as automobiles were at first constructed to look like buggies. It is likely that we shall gradually develop procedures more naturally and effectively adjusted to the new source of energy, abandoning the conventional kinks and detours inherited from chemical-fuel processes. Consequently, a few decades hence energy may be free—just like the unmetered air—with coal and oil used mainly as raw materials for organic chemical synthesis, to which, as experience has shown, their properties are best suited.

“Alchemy” and Automation

It is worth emphasizing that the main trend will be systematic exploration of nuclear reactions—that is, the transmutation of elements, or alchemy rather than chemistry. The main point in developing the industrial use of nuclear processes is to make them suitable for large-scale exploitation on the relatively small site that is the earth or, rather, any plausible terrestrial industrial establishment. Nature has, of course, been operating nuclear processes all along, well and massively, but her "natural" sites for this industry are entire stars. There is reason to believe that the minimum space requirements for her way of operating are the minimum sizes of stars. Forced by the limitations of our real estate, we must in this respect do much better than nature. That this may not be impossible has been demonstrated in the somewhat extreme and unnatural instance of fission, that remarkable breakthrough of the past decade.

What massive transmutation of elements will do to technology in general is hard to imagine, but the effects will be radical indeed. This can already be sensed in related fields. The general revolution clearly under way in the military sphere, and its already realized special aspect, the terrible possibilities of mass destruction, should not be viewed as typical of what the nuclear revolution stands for. Yet they may well be typical of how deeply that revolution will transform whatever it touches. And the revolution will probably touch most things technological.

Also likely to evolve fast—and quite apart from nuclear evolution—is automation. Interesting analyses of recent developments in this field, and of near-future potentialities, have appeared in the last few years. Automatic control, of course, is as old as the industrial revolution, for the decisive new feature of Watt's steam engine was its automatic valve control, including speed control by a "governor." In our century, however, small electric amplifying and switching devices put automation on an entirely new footing. This development began with the electromechanical (telephone) relay, continued and unfolded with the vacuum tube, and appears to accelerate with various solid-state devices (semi-conductor crystals, ferromagnetic cores, etc.). The last decade or two has also witnessed an increasing ability to control and "discipline" large numbers of such devices within one machine. Even in an airplane the number of vacuum tubes now approaches or exceeds a thousand. Other machines, containing up to 10,000 vacuum tubes, up to five times more crystals, and possibly more than 100,000 cores, now operate faultlessly over long periods, performing many millions of regulated, preplanned actions per second, with an expectation of only a few errors per day or week.

Many such machines have been built to perform complicated scientific and engineering calculations and large scale accounting and logistical surveys. There is no doubt that they will be used for elaborate industrial process control, logistical, economic, and other planning, and many other purposes heretofore lying entirely outside the compass of quantitative and automatic control and preplanning. Thanks to simplified forms of automatic or semi-automatic control, the efficiency of some important branches of industry has

increased considerably during recent decades. It is therefore to be expected that the considerably elaborated newer forms, now becoming increasingly available, will effect much more along these lines.

Fundamentally, improvements in control are really improvements in communicating information within an organization or mechanism. The sum total of progress in this sphere is explosive. Improvements in communication in its direct, physical sense—transportation—while less dramatic, have been considerable and steady. If nuclear developments make energy unrestrictedly available, transportation developments are likely to accelerate even more. But even "normal" progress in sea, land, and air media is extremely important. Just such "normal" progress molded the world's economic development, producing the present global ideas in politics and economics.

Controlled Climate

Let us now consider a thoroughly "abnormal" industry and its potentialities—that is, an industry as yet without a place in any list of major activities: the control of weather or, to use a more ambitious but justified term, climate. One phase of this activity that has received a good deal of public attention is "rain making." The present technique assumes extensive rain clouds, and forces precipitation by applying small amounts of chemical agents. While it is not easy to evaluate the significance of the efforts made thus far, the evidence seems to indicate that the aim is an attainable one.

But weather control and climate control are really much broader than rain making. All major weather phenomena, as well as climate as such, are ultimately controlled by the solar energy that falls on the earth. To modify the amount of solar energy, is, of course, beyond human power. But what really matters is not the amount that hits the earth, but the fraction retained by the earth, since that reflected back into space is no more useful than if it had never arrived. Now, the amount absorbed by the solid earth, the sea, or the atmosphere seems to be subject to delicate influences. True, none of these has so far been substantially controlled by human will, but there are strong indications of control possibilities.

The carbon dioxide released into the atmosphere by industry's burning of coal and oil-—more than half of it during the last generation—may have changed the atmosphere's composition sufficiently to account for a general warming of the world by about one degree Fahrenheit. The volcano *Krakatoa* erupted in 1883 and released an amount of energy by no means exorbitant. Had the dust of the eruption stayed in the stratosphere for fifteen years, reflecting sunlight away from the earth, it might have sufficed to lower the world's temperature by six degrees (in fact, it stayed for about three years, and five such eruptions would probably have achieved the result mentioned). This would have been a substantial cooling; the last Ice Age, when half of North America and all of northern and western Europe were under an ice cap like that of Greenland or Antarctica, was only fifteen degrees colder than the present age. On the other hand, another fifteen degrees of warming would probably melt the ice of Greenland and Antarctica and produce world-wide tropical to semi-tropical climate.

Rather Fantastic Effects

Furthermore, it is known that the persistence of large ice fields is due to the fact that ice both reflects sunlight energy and radiates away terrestrial energy at an even higher rate than ordinary soil. Microscopic layers of colored matter spread on an icy surface, or in the atmosphere above one, could inhibit the reflection-radiation process, melt the ice, and change the local climate. Measures that would effect such changes are technically possible, and the amount of investment required would be only of the order of magnitude that sufficed to develop rail systems and other major industries. The main difficulty lies in predicting in detail the effects of any such drastic intervention. But our knowledge of the dynamics and the controlling processes in the atmosphere is rapidly approaching a level that would permit such prediction. Probably intervention in atmospheric and climatic matters will come in a few decades, and will unfold on a scale difficult to imagine at present.

What could be done, of course, is no index to what should be done; to make a new ice age in order to annoy others, or a new tropical, "interglacial" age in order to please everybody, is not necessarily a rational program. In fact, to evaluate the ultimate consequences of either a general cooling or a general heating would be a complex matter. Changes would affect the level of the seas, and hence the habitability of the continental coastal shelves; the evaporation of the seas, and hence general precipitation and glaciation levels; and so on. What would be harmful and what beneficial—and to which regions

of the earth — is not immediately obvious. But there is little doubt that one *could* carry out analyses needed to predict results, intervene on any desired scale, and ultimately achieve rather fantastic effects. The climate of specific regions and levels of precipitation might be altered. For example, temporary disturbances —including invasions of cold (polar) air that constitute the typical winter of the middle latitudes, and tropical storms (hurricanes) — might be corrected or at least depressed.

There is no need to detail what such things would mean to agriculture or, indeed, to all phases of human, animal, and plant ecology. What power over our environment, over all nature, is implied!

Such actions would be more directly and truly worldwide than recent or, presumably, future wars, or than the economy at any time. Extensive human intervention would deeply affect the atmosphere's general circulation, which depends on the earth's rotation and intensive solar heating of the tropics. Measures in the arctic may control the weather in temperate regions, or measures in one temperate region critically affect another, one-quarter around the globe. All this will merge each nation's affairs with those of every other, more thoroughly than the threat of a nuclear or any other war may already have done.

The Indifferent Controls

Such developments as free energy, greater automation, improved communications, partial or total climate control have common traits deserving

special mention. First, though all are intrinsically useful, they can lend themselves to destruction. Even the most formidable tools of nuclear destruction are only extreme members of a genus that includes useful methods of energy release or element transmutation. The most constructive schemes for climate control would have to be based on insights and techniques that would also lend themselves to forms of climatic warfare as yet unimagined. Technology— like science—is neutral all through, providing only means of control applicable to any purpose, indifferent to all.

Second, there is in most of these developments a trend toward affecting the earth as a whole, or to be more exact, toward producing effects that can be projected from any one to any other point on the earth. There is an intrinsic conflict with geography — and institutions based thereon — as understood today. Of course, any technology interacts with geography, and each imposes its own geographical rules and modalities. The technology that is now developing and that will dominate the next decades seems to be in total conflict with traditional and, in the main, momentarily still valid, geographical and political units and concepts. This is the maturing crisis of technology.

What kind of action does this situation call for? *Whatever* one feels inclined to do, one decisive trait must be considered: the very techniques that create the dangers and the instabilities are in themselves useful, or closely related to the useful. In fact, the more useful they could be, the more destabilizing their effects can also be. It is not a particular perverse destructiveness of one particular invention that creates danger. Technological power, technological efficiency as such, is an ambivalent achievement. Its danger is intrinsic.

Science the Indivisible

In looking for a solution, it is well to exclude one Pseudo-solution at the start. The crisis will not be resolved by inhibiting this or that apparently particularly obnoxious form of technology. For one thing, the parts of technology, as well as of the underlying sciences, are so intertwined that in the long run nothing less than a total elimination of all technological progress would suffice for inhibition. Also, on a more pedestrian and immediate basis, useful and harmful techniques lie everywhere so close together that it is never possible to separate the lions from the lambs. This is known to all who have so laboriously tried to separate secret, "classified" science or technology (military) from the "open" kind; success is never more—nor intended to be more— than transient, lasting perhaps half a decade. Similarly, a separation into useful and harmful subjects in any technological sphere would probably diffuse into nothing in a decade.

Moreover, in this case successful separation would have to be enduring (unlike the case of military "classification," in which even a few years' gain may be important). Also, the proximity of useful techniques to harmful ones, and the possibility of putting the harmful ones to military use, puts a competitive premium on infringement. Hence the banning of particular technologies would have to be enforced on a worldwide basis. But the only authority that could do this effectively would have to be of such scope and perfection as to signal the resolution of international problems rather than the discovery of a means to resolve them.

Finally and, I believe, most importantly, prohibition of technology (invention and development, which are hardly separable from underlying scientific inquiry), is contrary to the whole ethos of the industrial age. It is irreconcilable with a major mode of intellectuality as our age understands it. It is hard to imagine such a restraint successfully imposed in our civilization. Only if those disasters that we fear had already occurred, only if humanity were already completely disillusioned about technological civilization, could such a step be taken. But not even the disasters of recent wars have produced that degree of disillusionment, as is proved by the phenomenal resiliency with which the industrial way of life recovered even—or particularly—in the worst-hit areas. The technological system retains enormous vitality, probably more than ever before, and the counsel of restraint is unlikely to be heeded.

Survival – A Possibility

A much more satisfactory solution than technological prohibition would be eliminating war as "a means of national policy." The desire to do this is as old as any part of the ethical system by which we profess to be governed. The intensity of the sentiment fluctuates, increasing greatly after major wars. How strong is it now and is it on the up or the downgrade? It is certainly strong, for practical as well as for emotional reasons, all quite obvious. At least in individuals, it seems worldwide, transcending differences of political systems. Yet in evaluating its durability and effectiveness a certain caution is justified.

One can hardly quarrel with the "practical" arguments against war, but the emotional factors are probably less stable. Memories of the 1939-45 war are fresh, but it is not easy to estimate what will happen to popular sentiment as they recede. The revulsion that followed 1914-18 did not stand up twenty years later under the strain of a serious political crisis. The elements of a future international conflict are clearly present today and even more explicit than after 1914-18. Whether the "practical" considerations, without the emotional counterpart, will suffice to restrain the human species is dubious since the past record is so spotty. True, "practical" reasons are stronger than ever before, since war could be vastly more destructive than formerly. But that very appearance has been observed several times in the past without being decisive. True, this time the danger of destruction seems to be real rather than apparent, but there is no guarantee that a real danger can control human actions better than a convincing appearance of danger.

What safeguard remains? Apparently only day-to-day — or perhaps year-to-year — opportunistic measures, a long sequence of small, correct decisions. And this is not surprising. After all, the crisis is due to the rapidity of progress, to the probable further acceleration thereof, and to the reaching of certain critical relationships. Specifically, the effects that we are now beginning to produce are of the same order of magnitude as that of "the great globe itself." Indeed, they affect the earth as an entity. Hence further acceleration can no longer be absorbed as in the past by an extension of the area of operations. Under present conditions it is unreasonable to expect a novel cure-all. For progress there is no cure. Any attempt to find automatically safe channels for the present explosive variety of progress must lead to frustration. The only

safety possible is relative, and it lies in an intelligent exercise of day-to-day judgment.

Awful and More Awful

The problems created by the combination of the presently possible forms of nuclear warfare and the rather unusually unstable international situation are formidable and not to be solved easily. Those of the next decades are likely to be similarly vexing, "only more so." The U.S.-U.S.S.R. tension is bad, but when other nations begin to make felt their full offensive potential weight, things will not become simpler.

Present awful possibilities of nuclear warfare may give way to others even more awful. After global climate control becomes possible, perhaps all our present involvements will seem simple. We should not deceive ourselves: once such possibilities become actual, they will be exploited. It will, therefore, be necessary to develop suitable new political forms and procedures. All experience shows that even smaller technological changes than those now in the cards profoundly transform political and social relationships. Experience also shows that these transformations are not a priori predictable and that most contemporary "first guesses" concerning them are wrong. For all these reasons, one should take neither present difficulties nor presently proposed reforms too seriously.

The one solid fact is that the difficulties are due to an evolution that, while useful and constructive, is also dangerous. Can we produce the required

adjustments with the necessary speed? The most hopeful answer is that the human species has been subjected to similar tests before and seems to have a congenital ability to come through, after varying amounts of trouble. To ask in advance for a complete recipe would be unreasonable. We can specify only the human qualities required: patience, flexibility, intelligence.

Extravagant Fiction Today—Cold Fact Tomorrow by Paul Carter

Science fiction in recent years has suffered a fall into respectability. Its new status was dramatized the morning after the moon landing of Apollo 11 (July 1969) when CBS interviewed several science fiction writers—Ray Bradbury, Arthur Clarke, Robert Heinlein—and listened to them with the same respect accorded by television that day to Henry Steele Commager, Norman Mailer, and sundry scientists, military men, and theologians. For writers like these, such deference was a new experience. At that time many followers of this held could still remember the days when they furtively purchased science fiction magazines and hid under jackets or sweaters their garishly colored covers, adorned with bug-eyed monsters in pursuit of not-quite-dressed girls. "A funny thing happened to me today in school," young Edmund Murman wrote toward the end of 1940, and he proceeded to tell the editors of *Amazing Stories* how his teacher had caught him reading their magazine in study hall and promptly confiscated it. (His letter was published in *Amazing* for January 1941, with a cautionary editorial caption: "During Study? Tush, Edmund.") In 1944, a Methodist minister in Idaho sold a story to one of the more lurid-looking pulps; when it appeared on the newsstands in the small town where he lived, he went out and bought every copy he could lay hands on lest his parishioners learn of his indiscretion.

Inevitably, skirmishes and harassments of this kind found their way into the stories themselves. Robert Heinlein, in his third published story, "Requiem" (*Astounding Science-Fiction*: 24, January 1940), made his hero at one point endure a conversational admonition Heinlein surely had not had to invent:

“The trouble with you is, you read too many of those trashy magazines. Now, I caught my boy reading one of 'em just last week and dressed him down proper. Your folks should have done you the same favor.” Was it the trash contained in the magazines (and much of it *was* trash, as even the most dedicated science fiction enthusiasts now admit) that prompted such putdowns? Or was it science fiction’s shocking insistence that the world of the future may really be *different* from the known, and therefore acceptable, world of the present? Not just bigger and faster, but different? Fear of that unknown “differentness” continues to haunt people’s imaginations today, inclining them to describe anything shockingly new as “like science fiction”—which tranquilizes their souls with the assurance that no matter how tangible an effect it is already having on their lives, the new phenomenon is, after all, fantastic and untrue.

Science fiction is an imaginative extrapolation from the known into the unknown. In a technological era, future technology becomes one of the more spectacular unknowns. Thus technological extrapolation was a major theme for Hugo Gernsback, who in 1926 founded *Amazing Stories*, the first periodical in the world devoted solely to science fiction, and thereby became the progenitor of all “those trashy magazines.” “It is most unwise in this age to declare anything impossible,” Gernsback affirmed in the June 1926 *Amazing*, “because you may never be sure but that even while you are talking it has already become a reality.” “If only five hundred years ago (or little more than ten generations), which is not a long time as human progress goes,” he wrote a month later, “anyone had come along with a story wherein radio telephone, steamships, airplanes, electricity, painless surgery, the

phonograph, and a few other modern marvels were described, he would probably have been promptly flung into a dungeon …There are few things written by our science fiction writers, frankly impossible today, that may not become a reality tomorrow."

This theme of prophecy disguised as fiction was stated in Gernsback's maiden editorial for *Amazing Stories* (April 1926), and it was an argument to which the crusading editor returned again and again. From the magazine's first issue onward, Gernsback's editorials, strategically visible to the reader on an odd-numbered page facing the table of contents, proudly carried the slogan "*Extravagant Fiction Today—Cold Fact Tomorrow*." Science fiction was not only legitimate as extrapolation, Gernsback suggested; it might even become a positive incentive to discovery, inspiring some engineer or inventor to develop in the laboratory an idea he had first read about in one of the stories. Furthermore, the stories were a comparatively painless way of imparting today's scientific and technical lore: "They supply knowledge that we might not otherwise obtain—and they supply it in a very palatable form."

The founder of *Amazing Stories* never recanted his faith. For the magazine's thirty-fifth anniversary issue (*Amazing*: 35, April 1961), Gernsback contributed a guest editorial: "As we look back over the vista of modern science fiction, we are struck by the fact that the outstanding stories in the held—the ones that endure—are those that almost invariably have as their wonder ingredient true or prophetic science." Nowadays, many readers, writers, and critics of science fiction would dispute that claim. As Brian Aldiss

put it in his historical study *Billion Year Spree* (1973), "Science fiction is no more written for scientists than ghost stories are written for ghosts."

However, we should resist the temptation to condescend. Although his editorial style at times irritatingly blended the note of Chautauqua uplift with that of the hard sell, Hugo Gernsback does seem quite sincerely to have conceived his mission as a species of popular education, in an age when a college degree was not yet the expected goal of most young Americans. And his readers and writers quickly picked up their editor's thesis that science fiction was also a means for learning science. "Print all scientific facts as related in the stories, in italics," one eager reader of *Amazing Stories* suggested (May 1926). The magazine's compositors did not take that advice literally, but many an author did provide brief cram courses in the requisite science or engineering, some¬ times more than the story really required. L. Taylor Hansen, for example, describing a tunnel under the ocean through which trains would be propelled by compressed air ("The Undersea Tube," in vol. 4, November 1929), vivified that brainchild by including with the text two cross-sectional drawings of the device. Most writers did not go quite so far, but they hardly needed to, with artist Frank R. Paul to fill the generously large pages of *Amazing Stories* (and its companions, *Amazing Stories Quarterly* and a short-lived *Amazing Stories Annual*) with imaginative and at the same time faithfully literal pen-and-ink renderings of their fictional technology.

Early in 1929 Gernsback lost control of the new magazines he had founded, in a merciless publishing war with Bernarr Macfadden. But Thomas O'Conor Sloane, his managing editor—a chemistry Ph.D. and the son-in-law of

Thomas A. Edison—stayed on under the new owners (Teck Publications), and continued very much in the founder's didactic tradition. "Readers may complain of the wild visions exploited in some science stories, where the authors seem to deal in absurdities," Sloane wrote in an editorial, "The Atom and the Stars" (*Amazing*: 5, November 1930). "Such people should read Eddington's latest paper"—referring to a forecast that well-known physicist had made of a power station operated by the energy contained in a teacup of water—"and see if the wildest imaginings of romancers go much beyond it."

II

Ten years after the birth of *Amazing Stories*, under Sloane's editorship some of the characters in the stories were still lecturing each other as if they were in school classrooms. Gathered around a campfire four days by canoe into the wilds of northern Quebec, in Edmond Hamilton's somewhat crude but chillingly effective story "Devolution" (*Amazing*: 10, December 1936), two of the campers sit digesting their hot- cakes and bacon while a third, having finished his evening pipe, fills them in on the theory of evolutionary mutation: "The germ cell of every living thing on earth contains in it a certain number of small, rodlike things which are called chromosomes. These chromosomes are made up of strings of tiny particles which we call genes. ..." The literary damage that could be done to a work of fiction in this fashion was obvious: "It is as easy to ruin everything by loving science too much as by understanding it too little," Isaac Asimov has written (*Opus 100*, 1969). From the standpoint of literary enjoyment, it is probably just as well that editors Gernsback and Sloane often broke their own rules.

As early as July 1926, for example, *Amazing Stories* reprinted H. G. Wells's "The Man Who Could Work Miracles," a delightful little yarn, but one classifiable as "science fiction" only by stretching that term a good deal. (The story "blurb" printed with Wells's brief opus—very likely written by Gernsback himself—managed tenuously to define the tale as science fiction by calling it an anticipation "of the modern conception of time-space"; surely this was straining at a gnat.) In that same issue in a letter to the editor, the young science fiction writer G. Peyton Wertenbaker warned: "The danger that may lie before *Amazing Stories* is that of becoming too scientific and not sufficiently literary." Having in mind other kinds of fiction that were being published in 1926 (e.g., The Sun Also Rises), some outside readers might have considered that Wertenbaker's definition of "literary" did not fill the bill either; for science fiction, Wertenbaker wrote, "is designed to reach those qualities of the mind which are aroused only by things vast, things cataclysmic, and things unfathomably strange."

In September 1927, *Amazing Stories* printed "The Colour Out of Space," by Howard Phillips Lovecraft, a writer whose work indeed dealt with things vast, cataclysmic, and unfath¬ omably strange. A few days after that story's acceptance, Lovecraft wrote to Gernsback's competitor, Farnsworth Wright, the editor of *Weird Tales* (July 5, 1927):

> "All my tales are based on the fundamental premise that common human laws and interests and emotions have no validity or significance in the vast cosmos-at-large."

Any story that ventured very far out into that cosmos must take account of its essential alienness—a long step indeed for readers accustomed to the premise that the proper study of mankind is man. Yet Howard Lovecraft, a serious literary craftsman, anchored many of his own tales in a specific (usually New England) setting for verisimilitude; "The Colour Out of Space," for example, was set in the central Massachusetts region then in the process of being flooded for Quabbin Reservoir. In his letter to Wright, printed in Lovecraft, *Selected Letters*, II (Sauk City, Wisconsin, 1968), Lovecraft argued that even in far-out interplanetary epics "the human scenes and human characters must be handled with unsparing realism."

"Unsparing realism," however, was hardly a hallmark of the work of Howard Phillips Lovecraft, the inventor of a writing technique one science fiction writer-critic has termed "First Person Delirious" (Algis Budrys, "H. P. Lovecraft and Others," *The Magazine of Fantasy and Science Fiction*: 49, September 1975). Nevertheless, that same critic argues, Lovecraft and the younger writers he influenced gave pulp science fiction some¬ thing it badly needed—"love of language, expressed both as vocabulary and as poetic effect in prose." Hugo Gernsback had, so far as I can tell from reading his magazines, no concern with style whatsoever; the main thing was to make the prophecy and expound the science, no matter how clumsily you told the tale. "But for the heirs of H. P. Lovecraft," Algis Budrys argues, "the humanities were necessarily part of their profession … To be struck in the eye by a word like 'eldritch' is at least to be made aware that there *are* more words than are normally heard in the street or found in school textbooks written down to the

level of the uneducated." Lovecraft, Budrys concludes, was a major force in transforming magazine science fiction from the literary mess so much of it was in Gernsback's day into an art form.

At the time *Amazing Stories* published Lovecraft's "The Colour Out of Space," however, that leavening influence was yet a long way off. More immediately important for the development of American science fiction was the influence of H. G. Wells. His literary method was almost the polar opposite of Lovecraft's, but it also represented a corrective on the clunky, marvel-upon-technical-marvel approach favored by Gernsback. Just as Lovecraft advised—but was himself rarely able to achieve—Wells's human scenes and human characters were handled with realism. The effectiveness of many of his novels, as Bernard Bergonzi has shown (*The Early H. G. Wells*, 1962), rests in part on their rootage in a concrete British milieu of hedgerows and crooked streets. Even when the action moves away from this planet, in *The First Men in the Moon*, the fabulous visions are filtered through the eyes of "Mr. Bedford," an archetypically commonplace lower-middle-class Englishman even more prosaic in outlook than an American astronaut. Similarly, Jules Verne's main theme had been man. *From the Earth to the Moon* is memorable not only for the accuracy of some of its predictions (e.g., the lunar missile would be bred from Florida, in fact only about a hundred miles from the actual Apollo launch site), but also for the characters in his imagined "Gun Club of America," who decide upon the moon shot and carry it out, a refreshing collection of eccentrics by comparison with the prim bureaucracy of NASA. Several novels by both Verne and Wells were reprinted in the early years of *Amazing Stories* (it was cheaper to reprint than

to buy new); and although the more recent generation of science fiction writers tended to take from the masters more their cosmic inventiveness than their perceptions of human nature, there were some significant exceptions.

One was David H. Keller, a physician from back-country Pennsylvania who differed from most of Gernsback's writers in his almost Thoreaulike aversion to a society based on machine technology. Subordinating the gadget to the gadgeteer, Keller typically described the marvelous inventions in his stories with beguiling imprecision. "All we need is a starter and a stopper," muses the hero of Keller's "The Flying Fool" (*Amazing*: 4, July 1929),

> and of course the stopper would be just a gradual shutting off of the starting force. Then there would have to be something to cause a progressive movement in the air, something like the propeller of an airplane and something more to guide the thing with, and there would have to be a method of obtaining power from the air

—so complete a caricature of the usual Gernsback engineering mystique as to amount to downright sabotage.

Another of Keller's early pieces, "The Revolt of the Pedestrians" (*Amazing*: 2, February 1928), made the Lamarckian forecast that as people continued to use automobiles their legs would atrophy to the point of complete uselessness, and that technology would close the gap by providing all citizens with individual-sized "autocars." (Babies, in this world of the future, go through a

phase for a few months of trying to use their legs, but it is something they are expected to get over, like thumb-sucking.) The magazine's heading for the tale was determinedly Gernsbackian: "There is excellent science in this story, and if you do not believe that too much riding in cars is bad for you, just speak to your doctor." But that comment grossly misinterpreted the author's intention. The exact technology of a wholly motorized population *could* have been validly made into science fiction; how, for example, did they manage school attendance, common meals, hospital care? But what intrigued Dr. Keller was the evolution of society itself under such conditions, and the opportunity this afforded for satire—and for the moral judgment that there can be such a thing as too much technology.

Later on, Keller made that judgment explicit in a serial, *The Metal Doom* (*Amazing*: 7, May, June, July 1932), in which all the metal in the world disappears and humanity perforce has to revert to simpler conditions—improvising log forts, pioneer style, out of the now useless telephone poles. (It was a theme to which science fiction was to return again and again, as will be seen in chapter 9). Cautionary tales like "The Revolt of the Pedestrians" and "The Metal Doom," however, stood in the early days of magazine science fiction as something of a dissenting opinion or minority report, in counterpoint to the prevailing scientism of Hugo Gernsback's editorials. That technical and scientific commitment never wavered, even after Gernsback lost control (as reported in the *New York Times*, February 21 and March 29, 1929) of the pioneering magazines he had founded.

Within weeks after the forced sale of *Amazing Stories*, the vivid primary colors—especially red—that characterized cover paintings by Frank R. Paul were adorning a brace of new monthly publications, *Science Wonder Stories* and *Air Wonder Stories*, together with a *Science Wonder Quarterly* to accommodate the longer stories. Volume One, number one of the first of these (June 1929) was inaugurated with a typical Gernsback editorial: "It is the policy of *Science Wonder Stories* to publish only such stories that have their basis in scientific laws as we know them, or in the logical deduction of new laws from what we know."

This time the magazine's founder buttressed his claim to scientific respectability by enlisting a panel of experts "to pass upon the scientific correctness of such stories." And an impressive panel it was. As listed in the third issue of *Science Wonder Stories* (August 1929), it included two astronomers, an astrophysicist, three botanists, a chemist, an entomologist, three mathematicians, an M.D., a psychologist, and a zoologist. They were affiliated with reputable institutions: Welles¬ ley, Dartmouth, the Armour Institute; one, Clyde Fisher, was curator of the American Museum of Natural History. Listed under "Physics and Radio" was Lee DeForest, inventor of the triode, the audio oscillator, the phonofilm method of sound recording, and much else. The consultant astrophysicist was Donald H. Menzel of the Lick Observatory, whose subsequent publications included *Selected Papers on Physical Processes in Ionized Plasma*, *Fundamental Formulas of Physics*, *Principles of Atomic Spectra*, and, significantly, some memorable debunking of the "UFOs" or flying saucers. Nor was this window dressing; Menzel has

informed me that Gernsback regularly sent him story manuscripts and took due account of his criticisms.

The hopes Hugo Gernsback expressed for his new venture, in its inaugural editorial, were high indeed. As with *Amazing Stories*, he seems to have aimed at a special-interest audience, not so much the general pulp magazine reader as the zealous amateur chemist, astronomer, or radio experimenter, who might also be reading *Popular Mechanics* or *Scientific American*.

Perhaps especially he appealed to the bright but introverted high schooler destined for Cal Tech or M.I.T. lost in one corner of a prestige world dominated by athletes, cheerleaders, fancy dressers, and good dancers, who in his loneliness would welcome the colorful appearance each month of *Wonder Stories* as the coming of a friend:

> Science fiction, as published in *Science Wonder Stories*, is a tremendous new force in America. They are the stories that are discussed by inventors, by scientists, and in the classroom. Teachers insist that pupils read them, because they widen the young man's horizon, as nothing else can.

Young men who had been dressed down for reading "those trashy magazines" might well have wistfully queried whether the existence of such teachers and classrooms were anything more than just another science wonder story! But in that golden year of 1929 some of their elders were believing in equally extravagant fictions of another sort. It may be worth noting here that the

philistine character in Heinlein's story "Requiem," who chastises the hero for reading those magazines and longing for the moon, ends by advising him to "stick to your discounts and commissions; that's where the money is."

III

As on much else in America, the Depression was rough on science fiction. Magazine circulations dwindled; *Amazing Stories* in its prime had had no difficulty in drawing a readership of more than 100,000, but by 1936 Hugo Gernsback doubted that that figure could be met by the combined circulations of all the science fiction magazines. *Air Wonder Stories* discontinued after a run of eleven issues (July 1929-May 1930); *Science Wonder Quarterly* lasted one more year. Their surviving companion, its title bobtailed to *Wonder Stories*, reduced its princely bulk and page size to more menial dimensions, reverted to a rawer grade of pulp paper, went bimonthly, and—frowsiest touch of all—ceased trimming its edges. Amazing, under its post-Gernsback management with Dr. Sloane as editor, went through the same process of physical deterioration. Beginning with the June 1938 issue, *Amazing Stories* moved to Chicago under still a third owner, Ziff-Davis, Inc. Its content radically changed in an action-adventure direction. Nevertheless, in a subtitle carried on the front cover for the first year or so under Ziff-Davis, die new management paid a lingering tribute to the Gernsback tradition: "All Stories Scientifically Accurate."

Meanwhile, in a desperate last effort to keep his own magazine afloat, Gernsback proposed to take it off the newsstands and sell it by subscription

only (editorial in Wonder Stories, April 1936). The gambit failed. Purchased by a pulp adventure magazine chain, *Wonder Stories* with its August 1936 number became *Thrilling Wonder Stories*. Its first editorial paid lip service, at least, to Gernsback's canons of scientific plausibility. But a new slogan run in red letters across the bottom of the cover painting suggested that the latest owners had quite a different perception of their audience: "Stranger Than Truth."

The depth of the Depression saw also the hopeful launching of the third (fourth, if we count *Weird Tales*, to be dis¬ cussed further below) of the pioneering science fiction magazines. Surviving to our own day under the name *Analog*, this one has acquired a certain dowager gentility. Four and a half decades ago it called itself, with less restraint, *Astounding Stories of Super-Science*. The contrast in tone with Gernsback's *Wonder* and Sloane's *Amazing Stories* was marked. In *Amazing*'s more affluent days, around 1927, a strip of type at the bottom of the front cover had listed its companion magazines: *Radio News*, *Science and Invention*, *Radio Listener's Guide*, *Radio International*, and—typically for the period—Spare-Time Money Making. By contrast, Astounding's first contents page listed among its fellow travelers in the Clayton magazine chain such titles as *Ace-High*, *Ranch Romances*, *Cowboy Stories*, *Clues*, *All Star Detective Stories*, *Flyers*, *Forest and Stream*, and *Miss* 1930. Nevertheless, in a kind of pulp parody of Gernsback, *Astounding*'s editor Harry Bates made the same kind of predictive claim. There had been a time when the idea of circumnavigating the earth or of wireless telegraphy, aircraft, sixty-story buildings, radio, and so on would have seemed fantastic, and that is the only real difference between the

astounding and the common- place—Time" (editorial, "Introducing Astounding Stories," January 1930). Ordinarily, however, Bates did not even write editorials. He started a letter column, mandatory for science fiction readers by that time; otherwise he let the raw pulp action-adventures brawl on.

Somehow, paradoxically, that period of hard times economic, scientific, and literary—was quietly incubating the creativity of a coming new generation of science fiction writers. Frederik Pohl, who lived through it all, has said (in *The Early Pohl*, 1976) that it was the discrepancy in the world they lived in, sociopolitically a failure so far as anyone could tell, but technically and mechanically a brilliant success, that turned these kids on to science fiction. Pohl's memoir and others (*The Early Asimov*, 1972; *Early Del Rey*, 1975; and so on) tell with reminiscent fondness of that era, when a ten-cent hot dog was enough to get a schoolboy through lunch and you could go to the movies for a dime—but if you lived in New York you took your stories personally around to the magazines, because the nickel subway fare (or walking) was cheaper than sending the stuff through the mails with return postage at one three-cent stamp every thousand words. In due course these brash youngsters as a result would develop an unusual and highly personal relationship with science fiction's busy editors, who on occasion might reject an author's story and then buy him lunch. But that future was hidden from most of them in the dismal early 1930s.

In 1933 the Clayton chain, which had won the esteem of professional pulp writers by paying as much as three cents a word—princely wages for those

times—failed. *Astounding Stories* skipped seven months, and then reappeared under the imprint of another chain publisher, Street and Smith, which had begun life clear back in the Gilded Age as a producer of Western and detective dime novels. Its new editor, F. Orlin Tremaine, promptly began to upgrade the magazine's contents, both scientific and literary. To implement these new policies, the new editor introduced what he called the "thought-variant" story, opening the way to bold if sometimes shaky philosophical speculation and, more cautiously, to the breaking of a few magazine taboos.

Praising him for these innovations, Harold Collender, in a letter to the editor (*Astounding*: 12, January 1934), contrasted the style of the former Clayton pulp *Astounding* with its competitors, *Amazing* and *Wonder*. In so doing, reader Collender acutely analyzed the dilemma for all science fiction editors and writers, of how to deal with science in fiction in such a way that the result was both valid as science and viable as fiction:

> The old *Astounding*, frankly, stood in the main for plain, outright action-adventure stories, such as you may read in any ordinary magazine, but surrounded, to give them a tiny taste of newness, by mechanical gadgets, planets, world-menaces, horrible villains from interstellar space. The joker was that most of its authors, though they could think up these things and make them terribly blood-curdling, couldn't begin to explain them plausibly or indeed intelligently at all. It was all done for the thrill, the kick, the climax, and the happy ending …

> Well, the other two magazines *could*—or made out as if they could—explain the machines and the invaders and the funny new diseases. ... In fact, they explained for pages and pages, and then put on a couple of more pages of footnotes, still doggedly explaining. But in the heat and stress of explanation, they forgot utterly that there is such a thing as literary art.

It was a problem not fully solved under the Tremaine regime, if indeed it is intrinsically soluble at all. Meanwhile, taking a cue from his competitor Dr. Sloane, Tremaine enhanced the scientific credibility of the stories in the new *Astounding* by also running factual articles. By 1937 these had become quite solid expository essays; they included, for example, Willy Ley's "The Dawn of the Conquest of Space" (*Astounding*: 19, March 1937), a sober and informed discussion of the advantages of liquid-fueled over solid-fueled rockets, and R. D. Swisher's "What are Positrons?" (August 1937), an admirable exposition in laymen's language of the Dirac theory. Tremaine encouraged the readers also to address themselves to technical questions. "I have been pleased to see serious discussions of scientific data creeping into Brass Tacks" (the magazine's name for its letter column), Tremaine noted, and in the November 1936 issue, partly on the ground that, by their treatment of stories and artwork in terms of superficial likes and dislikes, the letters to the editor were becoming monotonous, he announced that he was converting the "Brass Tacks" department into "Science Discussions."

Tremaine described this change with an enthusiasm that out-Gernsbacked Gernsback: "There is no reason why *Astounding* should not serve as an

exponent of scientific advancement." Out of the readers' bull sessions in "Science Discussions," the editor predicted, could come major scientific breakthroughs: "We must so plan that twenty years hence it will be said that *Astounding Stories* has served as the cradle of modern science." Somehow it did not work out that way. Within the limits of their own scientific competence, some readers sought to comply, submitting letters to "Science Discussions: The Open House of Scientific Controversy" on spectroscopy, rocket engineering, mathematical puzzles, the effect of liquid air on magnetism, or a theory to account for the retrograde motion of Jupiter IX. But they also took up great amounts of space riding hobbyhorses, such as the Atlantis hypothesis, or questioning whether for interplanetary flight the achievement of escape velocity was really necessary. Tremaine's successor as *Astounding*'s editor, John W. Campbell, Jr.—whose scientific credentials were rather more impressive than Tremaine's—quietly reversed the priorities, changing the name of the column (in vol. 22, November 1938) to "Brass Tacks and Science Discussions."

If "Science Discussions" never quite raised *Astounding* into a vest-pocket version of the proceedings of the Royal Society, nevertheless the scientific criticism in these letters from readers did serve to discipline the science served up in the stories. In the *Amazing Stories* "Discussions" column under Sloane and in the "Reader Speaks" department in *Wonder Stories* under Gernsback, vigilant readers had frequently spanked authors for factual errors in their fiction (e.g., providing the moon with an atmosphere), and they continued to do so in *Astounding*'s "Brass Tacks" under Campbell. For example, when Alexander M. Phillips contributed to Astounding a story titled "A Chapter

From the Beginning," detailing an adventure of a shambling primordial hominid named Nwug (*Astounding*: 25, March 1940), one alert reader (C. S. Gregg, in "Brass Tacks" for May 1940) deduced that the story was supposed to have taken place in North America during the Miocene period, and that the life forms Phillips described as having existed then were, from the standpoint of paleontology, anachronisms; moreover, that a being so relatively advanced as Nwug would definitely not have walked on its knuckles. Some readers went after the artists as well; "the helical sweep of a mammoth's tusk is admittedly not easy to draw," wrote Caleb Northrop (*Astounding*: 24, September 1939), "but it's a shame that Mr. Wesso didn't drop up to the American Museum of Natural History to see how the problem is handled by specialists." The scientific interest of many readers ran ahead of their actual expertise, but enough people with advanced degrees in sci¬ ence or engineering read the magazines and wrote the editors to give these criticisms some show of authority.

In "The Eyrie," as the letter column in *Weird Tales* was called, this kind of criticism was all but nonexistent. Founded three years before *Amazing*, in 1923, *Weird Tales* was not strictly speaking a science fiction magazine. Its editor, Farnsworth Wright, had to steer a course between two opposed categories of readers, one of which enjoyed science fiction, while the other, attuned to Gothic supernaturalism, wanted no science at all in the stories. Arguments among that magazine's readers in the 1930s raged not over the mistakes in the stories, but over the nudes in Margaret Brundage's cover paintings. To be sure, some *Weird Tales* correspondents, such as Forrest Ackerman and Sam Moskowitz— both of whom remained active into the

1970s—also read the science fiction magazines, and judged the latter by rigorous Gernsbackian standards. Other readers of Weird Tales, how¬ ever, insisted that they did not want science in their fiction. "The hard facts of science, the coldness of time-travel and space-travel," wrote L. A. Petts from Tolworth, England (*Weird Tales*: 31, April 1938), "do not mix … with old-age romance and witchery." That sentiment was savagely reciprocated by some on the science fiction side. "Are you in such dire straits that you must print this kind of drivel?" asked Cleveland C. Soper when Tremaine ventured to publish a three-part serial by Howard Phillips Lovecraft, which *Weird Tales* had rejected (letter in *Astounding*: 17, June 1936). " …This story does not belong in *Astounding Stories*, for there is no science in it at all." Unimpressed by the considerable literary clout Lovecraft had amassed by that time, and apparently unaware that a Lovecraft story had once passed muster with Gernsback, Soper warned: "If such stories as this—of two people scaring themselves half to death by looking at the carvings in some ancient ruins, and being chased by something that even the author can't describe, ... are what is to constitute the future yarns of *Astounding Stories*, then heaven help the cause of science-fiction."

IV

There were limitations as to how effective this sort of purist scientific discipline could be. Some writers who had them¬ selves started out as science fiction fans, turning out amateur fiction and literary criticism in their mimeographed fan magazines prior to turning professional, eagerly accepted the Gernsback-Sloane-Tremaine-Campbell guidelines. But not all such fan

writers conformed. Ray Bradbury, who began to publish professionally in the early 1940s, stated in a 1974 interview (Arizona Daily Star, Tucson, September 28, 1974) that in matters of science he was "totally stupid." In fact, he added, "If you're too good a scientist, you're not a good writer. Others, less conscientious than either Bradbury or his more science-oriented fan contemporaries (e.g., Isaac Asimov and James Blish), were simply impatient at the necessity for interrupting their story lines to get the science straightened out. They were, after all, writing for cash for magazines published as men's-adventure pulps in which fast action was the *sine qua non*, and they were not being paid anything extra for doing encyclopedia research.

Such writers quickly found ways of finessing the science fiction editors' and readers' requirements. As one successful practitioner pointed out (Ross Rocklynne, "Science-Fiction Simplified," *Writer's Digest*: 21, October 1941), you could always fake it, either by telling your story from the uncomprehending layman's point of view ("I don't recall everything he said—it was way over my head") or by having the learned professor's explanation interrupted by action such as a woman's scream. At the story's climax, the pulp canons of rugged adventure commonly pushed the gadgets offstage anyhow. "Why does science collapse the minute the hero puts a strain on it?" reader Myrtle Gebhart complained (letter in "Brass Tacks," *Astounding*: 25, June 1940): "Most of the s-f writers build up their backgrounds beautifully. Then, at the crucial moment, ye hero's atom gun doesn't work, or some¬ thing goes wrong with the cyclotrons, or his ray beam, or his held of force—so he goes to it with his fists. ... It's such a let¬ down,

makes one wonder: when such improvements come— problematical, but possible—won't science be able to hold its own?"

Some of the authors contrived to create super-scientific marvels by the simple expedient of coining words. Many readers eventually developed an indulgent affection for this kind of foolishness, in which (to quote a letter to the editor by Charles W. Jarvis in *Astounding*: 24, December 1939) "Buck Rogers chases Killer Kane through Martian skies with a flying belt and Jack Williamson uses his famous geo … s—supply your own endings, they all sound good—to send the villain to perdition in the vastness of inter-universal space." As a matter of fact, the editors themselves, even men so conscientious as John W. Campbell and T. O'Conor Sloane, occasionally sabotaged the effort at scientific exactness in the interest of telling a good story. Sloane, for example, did not personally believe in the possibility of interplanetary travel. But he justified publishing stories on that theme nevertheless, "since our readers like inter-planetary stories; since they unceasingly ask for them in letters to us, and since there is any amount of science ... to be gleaned therefrom" (*Amazing*: 4, November 1929). As for John Campbell, when chided by several readers for having accepted and published one story based upon an astronomical impossibility, he replied (*Astounding*: 29, May 1942) that the basic idea was "interesting enough to make the flaw forgivable." Years afterward, in an article "Science Fiction We Can Buy" (*The Writer*: 81, September 1968), Campbell made this policy quite explicit: "Minor goofs in science— provided they're not crucial to the theme of the story—can be forgiven."

Nevertheless, he warned prospective writers for his magazine, the manuscripts he most frequently rejected were writ¬ ten by "people who don't know the difference between science fiction and fantasy." Campbell and his competitors—Gernsback and Sloane in the early years, and later Horace Gold and Anthony Boucher—violated their self-imposed rules sparingly, in the same way that a detective story writer is allowed an occasional false clue or improperly planted suspect in the interest of telling a good story, provided he or she ordinarily plays fair with the reader. This principle of fair play adds a dimension to science fiction criticism that the critic of other kinds of fiction does not usually have to consider.

People unaware of this dimension in science fiction quite commonly don't know what to make of the beast. Take, for example, the second sentence of A. E. Van Vogt's first published story, "Black Destroyer" (*Astounding*: 23, July 1939):

> The black, moonless, almost starless night yielded reluctantly before a grim reddish dawn that crept up from his left.

In an English Lit classroom a teacher would probably discuss this passage in terms of its imagery, showing how the author used color words—black, reddish, and so on—to establish a mood. The teacher might consider the passage overwritten, pointing out that nights are not "reluctant" nor dawns "grim," save as we perceive them so. If he took this line of argument, how¬ ever, he would miss the point that this particular fictional night is moonless and almost starless for a scientifically necessary reason. The action in the story

takes place on the only planet of a solar system nine hundred light years distant from any other star, and its night sky *would*, in fact, be blacker than the one we are accustomed to. With no worlds near enough to reach by simple rocket propulsion, the highly intelligent race that inhabits the planet has never had the incentive nor the ability to travel through space— *and in the story that fact is crucial*. Van Vogt's sentence rightly read, therefore, tersely and economically conveys a great deal of information, but the reader who knows little and cares less about science will miss the message entirely. To attempt to *teach* science fiction, as has been much in vogue in recent years, without awareness of this dimension of the subject can be disastrous.

Even with the population explosion of new science fiction magazines around 1939 (*Science Fiction* and *Future Fiction*, *Startling Stories*, *Planet Stories*, *Comet*, *Stirring Science Stories*, *Dynamic Science Stories*, *Super Science Stories*, and all the rest), the effort to safeguard the integrity of the science in science fiction continued. Nothing infuriated regular readers more than to have an "outsider" patronize their held by asserting, as Phil Stong did in the foreword to his hardcover anthology from the pulps, titled *The Other Worlds* (New York: Funk and Wagnalls, 1941), that "the first requirement of a good fantastic story—and half the magazines who specialize on these things neglect the fact—is that it should not be even remotely possible." Reviewing Stong's book for one of the newer magazines (*Astonishing Stories*: 3, September 1941), science fiction fan, author, and editor Donald A. Wollheim indignantly declared: "No self-respecting editor (even of a fantasy magazine) or writer goes on such a basis."

Amazing Stories under its Chicago management, together with its new companion, *Fantastic Adventures*, was frequently condemned by fans for straying away from the canons of "good" science fiction; yet it was the assistant editor of those magazines, Jerry K. Westerheld, who testified ("The Sky's No Limit," *Writer's Digest*: 20, January 1940) that "most of our regular authors"—young men between twenty and thirty years old, who made between $1,200 and $2,400 a year from their writing—"*take their work very seriously*." They believed that space travel to Mars and suspended animation for thousands of years and other technical marvels "are definitely coming in the near future."

There was, of course, the embarrassing possibility that even when the science in the stories was accurate, as far as anyone could tell at the time they were written, the scientists themselves might one day change their minds. But that, veteran science hedonist Isaac Asimov insists, is not quite the point. In one of his regular "Science" columns for *Fantasy and Science Fiction* (vol. 47, October 1974), Asimov has argued that, yes, science fiction extrapolates from the known to the unknown— but not to the point of on-the-hour forecasting of tomorrow's weather or the next day's Dow Jones closing averages: "With fortune-telling the science fiction technique has little to do."

Horace Gold, the able editor of *Galaxy Science Fiction* (founded in 1950), concurred (editorial in *Galaxy*: 3, November 1951): "What science fiction must present entertainingly is speculation. Not prophecy, but fictional surmises based on present factors, scientific, social, political, cultural, or what¬ ever. When a story hits a future development on the head, it should be

considered a minor accident; its main job was not to *predict*, but to *conjecture* what might happen if certain circumstances followed certain lines of development."

Moreover—and this is crucial—there are other kinds of implausibilities besides the purely scientific. "You haven't a single author on your payroll who displays any real social insight," complained J. E. Enever, one British reader of *Astounding*, in a letter to the editor early in 1940. "Briefly, you can do with some H. G. Wellses or Olaf Stapledons to supplement your army of Vernes" (vol. 25, March 1940, p. 151). The charge was not quite fair; there had been through the 1930s an occasional Nathan Schachner, David H. Keller, or Miles J. Breuer who had engaged, sometimes clumsily, in social criticism. On the whole, however, Enever's charge was just, and it is a criticism of science fiction that continues to be made, especially by people who have not read very much science fiction. By 1940, however, the situation had changed. Ironically, on the page just previous to Enever's highly critical letter were printed the closing paragraphs of a two-part serial, Robert Heinlein's "If This Goes On-," which seriously tried to apply the insights of the social rather than the natural sciences; and the very next issue of *Astounding* carried the first installment of L. Ron Hubbard's "Final Blackout," a somber forecast—with no technological gimmickry whatsoever—of one possible outcome of the then-raging Second World War.

V

Even on that score, the magazines in a sense had the last word. Future war—including future nuclear war—had been fictionally forecast for a quarter of a century, most notably by H. G. Wells in *The War in the Air* (1908) and *The World Set Free* (1914). It was in continuity with science fiction's own traditions, therefore, that the October 1939 number of *Amazing Stories*, which appeared on the newsstands in the month of August, should carry a grim tale of a renewed outbreak of war in Europe. Titled "Judson's Annihilator," it was based on the major premise that "the scientists' brains have built the twentieth century; their morals will blow it to bits." In the story, an aerial invasion of England is thwarted when the fleet of enemy warplanes is warped into another era by time machine. But this is no conventional evil-Nazis-versus-pure-Englishmen epic; for the English hero enters that future time only to discover, as have the German fliers who preceded him, that regardless of which side "wins" the present war, the world will become a savage ruin. "When I began to plan this story," its British author, John Beynon Harris, explained, "I found that there was no need to use that hoary old standby the mad scientist … when the reputedly sane scientists are quite efficiently getting on with the job of world destruction before our eyes" (comment in "Meet the Author," *Amazing*: 13, October 1939). And the brief essay describing the magazine's back cover for that month, a painting of an atomic power plant, noted that atomic energy also could be employed in war, releasing "power so terrible that entire cities might be blasted away."

On August 6, 1945, over a crowded city in Japan, the extravagant fiction of today became the cold fact of tomorrow. Many science fiction writers during the war suspected in general what was going on; a few of them worked on

secret military research; one wrote a story close enough to the actual technology of the yet-unbuilt American atomic weapon that when *Astounding*'s editor John Campbell published it the FBI came calling ("Deadline," by Cleve Cartmill, *Astounding*: 33, March 1944). Interestingly, one regular reader found that story scientifically implausible! "Deadline," whose plot turned upon two subcritical masses of U-235 being brought together to cause a nuclear chain-reaction explosion, according to M. Eneman (letter in "Brass Tacks," ASF: 33, July 1944), was "mediocre fantasy."

As a group, these authors "had been living very close to atomic power for a long time," Theodore Sturgeon testified in a story published not long after Hiroshima ("Memorial," ASF: 37, April 1946). "All of them were quite aware of the terrible potentialities of nuclear energy," said Sturgeon. "Practically all of them were scared silly of the whole idea." Their fear, however, pilot to Hiroshima, was for humanity in general; for themselves, except in a delicious drawing room sort of way," most of them were not afraid, "because they couldn't conceive of this Buck Rogers event happening to anything but posterity."

But it had, and it threw the science hedonists into a moral dilemma Hugo Gernsback had probably never anticipated. "A mother can tell her child exactly what will happen if he sticks his hand in the fire; that doesn't mean she wants it to happen," John Campbell defensively explained ("Science-Fiction and the Opinion of the Universe," *Saturday Review*, May 12, 1956). Less loftily, Isaac Asimov, on behalf of his colleagues, made what amounted to an act of contrition. "Well, the atomic bomb came, and it finally made

science fiction 'respectable,'" Asimov wrote (in *Opus 100*, 1969): "For the first time, science-fiction writers appeared to the world in general to be something more than a bunch of nuts; we were suddenly Cassandras whom the world ought to have believed. But I tell you, I would far rather have lived and died a nut in the eyes of all the world than to have been salvaged into respectability at the price of nuclear war hanging like a sword of Damocles over the world forever."

Prophecy was indeed, as Asimov elsewhere noted, some¬ thing different from fortune-telling.

But if the recoil from the extravagant fact of today could be so strong, how deeply rooted had been the Gernsbackian commitment to cold reality in the fiction of tomorrow? Had most science fiction readers experienced merely a *frisson* from die stories, of the kind a hard-headed skeptic might get from a ghost story well-enough told to convince him or her momentarily that "this could be true"? The question is not entirely rhetorical; early in 1939 Campbell launched a companion magazine to *Astounding* called *Unknown*. Although the new publication dealt not in rocket ships and ray guns, but in elves and witches and vampires, it was quickly apparent that the two magazines had heavily overlapping constituencies. The paradox was not lost on alert readers (and writers): "The Jekyll- science-fictionist stands for experimental truth, for logic, for *proof*. The Hyde-nocturnal-seeker exists in frank fear of the dark, in the world of dreams ... of witches'-brew, of curses, of Kismet. Fantasy fiction," concluded Seymour Kapetansky, "has bred the most illogical double-track mind in history," able to enjoy both the brisk technocratic forecasts of

Astounding and the sinister revenants in *Unknown* (letter in *Astounding*: 24, October 1939).

However, the paradox may be more apparent than real. The fact of today may have become so extravagant that no mere fiction could cope with it. Back in Gernsback's heyday, Clarence E. Ayers (in *Science: The False Messiah*, 1927) had compared the findings of modern science with the messages of ancient Israel's prophets, and found both equally fabulous:

> These men tell tales of the creation of all living things from primordial ooze, of the origin of the earth from spouts of incandescent gas from the sun, of rays that penetrate the solidest-seeming stuff … They sing of matter which is not matter but energy . . . which changes places from moment to moment, and of different moments which are simultaneous in different locations. These are the real marvels of the age of science. We must not dismiss them lightly because we believe that they are true…
>
> To be sure, science does not represent itself as folklore … Folklore never does. We must not imagine Moses coming down from Mount Sinai and urging Joshua and Aaron to bear in mind that his various narratives are folklore. It was enough that they were marvelous … But it should also be a mistake to suppose that the Israelites were as surprised by Moses' story as we should be, or as surprised as they would have been to hear him say that he had been borne through the clouds at one hundred twenty miles to the hour and accompanied by the

sound of an awful roaring. Sufficient unto the day is the folklore thereof.

Some readers and writers of *Weird Tales* had always under¬ stood this point. "We live in a weird universe, whose surface we have barely scratched," one such author declared—in an early letter-column debate over the inclusion of more science fiction alongside the magazine's usual supernatural lore, published an entire year before Gernsback founded *Amazing* (Norman Elwood Hammerstrom in "The Eyrie," Weird Tales: 5, January 1925, 181). "The wildest miracles are perfectly possible. As people learn more and more, such stories as mine [a science fiction thriller titled "The Brain in the Jar"] will seem more plausible." Thumbing through the crumbling pulp pages of *Amazing, Astounding,* and *Wonder,* it is possible to find stories, putatively science fiction by Gernsback's or Campbell's definition, which at deeper evocative levels yield quite a different meaning. The nightmare world depicted by Jack William¬ son in "Through the Purple Cloud," to take one early example (*Wonder Stories*: 2, May 1931), a crater-enclosed black land¬ scape under an empty red sky from which fall football-sized drops of viscid rain, is a long psychic voyage away from Hugo Gernsback's "cold fact of tomorrow." Gernsback himself noted that the scene might well have been imagined by Poe.

Unknown was a casualty of the austerities of wartime publishing. *Weird Tales* folded in the general collapse of the pulps in 1954. Of the four pioneer magazines in the science fiction held, the two that have survived, *Astounding* (now *Analog*) and *Amazing Stories* (now *Amazing Science Fiction*), were also

two that had ordinarily eschewed ghost stories and other forms of supernaturalism. Always, states Greg Benford (*Amazing*: 49, September 1975), the fantastic happening in science fiction "is rendered credible by the concrete underpinning of scientific fact. Without this hard basis, science fiction becomes science fantasy."

Amazing's pages in recent years, however, have also contained numerous tales classifiable as borderline cases; for example, the story "Lord of Rays" by Robert F. Young (*Amazing*: 49, July 1975), in which a conventionally equipped astronaut in orbit around the sun encounters an Egyptian mummy, laid out in an oar-propelled sun boat as described in the Book of the Dead. Even the more hard-nosed, engineering-oriented Analog, in the second installment of a serial "Cemetery World," by Clifford D. Simak (*Analog*: 90, November, December 1972; January 1973), introduced the readers to a band of ghosts led by a garrulous shade named Ramsay O'Gillicuddy.

(Their ghost-hood is scientifically verified, more or less, but the explanation in essence comes down to the old "psychic residue" theory, set forth in Latin as long ago as the first century a.d. in a haunted house story by Pliny the Younger.) More¬ over, in the postwar years non-scientific or supernatural fantasy has made its own magazine comeback, both in its own right (*Fantastic*, founded 1952) and in a periodical devoted to both genres (*The Magazine of Fantasy and Science Fiction*, 1949). During the new vogue for the occult in the early 1970s— *Rosemary's Baby*, *The Exorcist*, and so on— there was even a brief but heroic attempt to revive the twenty-years-defunct *Weird Tales*.

In short, the “illogical double-tracked mind” first noted in 1939, living simultaneously in a brightly lighted technological wonderland and in the darkness of graveyards and dreams, is still very much with us. But perhaps the science fiction/fantasy writer and reader is only giving voice to the present-day experience of Everyman—-who also, in a rapidly changing world, whether or not he wants to, must make his own extrapolations from the known into the unknown.

Poetry From the Past

Four Poems by D.H. Lawrence

Cherry Robbers

Under the long dark boughs, like jewels red
In the hair of an Eastern girl
Hang strings of crimson cherries, as if had bled
Blood-drops beneath each curl.

Under the glistening cherries, with folded wings
Three dead birds lie:
Pale-breasted throstles and a blackbird, robberlings
Stained with red dye.

Against the haystack a girl stands laughing at me,
Cherries hung round her ears.
Offers me her scarlet fruit: I will see
If she has any tears.

Gloire de Dijon

When she rises in the morning
I linger to watch her;
She spreads the bath-cloth underneath the window
And the sunbeams catch her
Glistening white on the shoulders,

While down her sides the mellow
Golden shadow glows as
She stoops to the sponge, and her swung breasts
Sway like full-blown yellow
Gloire de Dijon roses.

She drips herself with water, and her shoulders
Glisten as silver, they crumple up
Like wet and falling roses, and I listen
For the sluicing of their rain-dishevelled petals.
In the window full of sunlight
Concentrates her golden shadow
Fold on fold, until it glows as
Mellow as the glory roses.

The Mess of Love

We've made a great mess of love
Since we made an ideal of it.
The moment I swear to love a woman, a certain woman, all my life
That moment I begin to hate her.

The moment I even say to a woman: I love you!—
My love dies down considerably.

The moment love is an understood thing between us, we are sure of it,

It’s a cold egg, it isn’t love any more.

Love is like a flower, it must flower and fade;
If it doesn’t fade, it is not a flower,
It’s either an artificial rag blossom, or an immortelle, for the cemetery.

The moment the mind interferes with love, or the will fixes on it,
Or the personality assumes it as an attribute, or the ego takes possession of it,
It is not love any more, it’s just a mess.
And we’ve made a great mess of love, mind-perverted, will-perverted, ego-perverted love.

Intimates

Don't you care for my love? she said bitterly.

I handed her the mirror, and said:
Please address these questions to the proper person!
Please make all requests to head-quarters!
In all matters of emotional importance
please approach the supreme authority direct! –

So I handed her the mirror.
And she would have broken it over my head,
but she caught sight of her own reflection
and that held her spellbound for two seconds

while I fled.

Two Short Poems by Wendy Cope

Defining the Problem

I can't forgive you. Even if I could,
You wouldn't pardon me for seeing through you.
And yet I cannot cure myself of love
For what I thought you were before I knew you.

As Sweet

It's all because we're so alike —
Twin souls, we two.
We smile at the expression, yes,
And know it's true.

I told the shrink. He gave our love
A different name.
But he can call it what he likes —
It's still the same.

I long to see you, hear your voice,
My narcissistic object-choice.

Novella: A Snowy Afternoon by Patrick Bruskiewich

When she got in the car Anna has said Hello or *Dzien Dobre* – good day in Polish – to my uncle and the two of them had immediately struck up a conversation in Polish, leaving me the odd man out, since I did not speak the language.

As we drove in the direction of her home Anna turned to me and said that she asked her mother whether she could spend part of the day with me instead of going straight home. I was in the front seat and she was in the back of my uncle's old brown Buick and so my uncle heard the whole conversation. She said she could be picked up in the middle of the afternoon, if that was more convenient for me.

My uncle said something in Polish and Anna smiled and so I assumed it was fine by him and I said it was ok, if it was ok for my aunt and uncle. My uncle turned to me and said that my aunt and uncle would enjoy the visit, and the chance to meet one of my Polish school friends. My aunt could not speak English but I was not immediately suspicious of what mischief the two could get into, at my expense.

I smirked at Anna and she mockingly smirked back. I wanted to defuse the moment and so I asked my uncle to turn on the radio. His old Buick was from the 1950's and so it did not have a solid state radio. It had old radio tubes. When you turned the radio on it took several seconds to warm up before any sound was heard. In those few seconds a hum filled the car with its neutral tone.

Then the radio sprang to life with Christmas music. The crooner Bing Crosby filled the car with I'm Dreaming of a White Christmas. As I looked out the window I thought, how appropriate.

Anna and my uncle continued talking in Polish as we drove through the older parts of Edmonton, down a side street and then down into a ravine. Then Anna got concerned. "Where are we going?"

"Oh," I paused for effect, "down to an old coal mine where my aunt and uncle live as the custodians."

"A coal mine!" She was honestly astounded.

"Yes, a coal mine. My grandfather and uncle use to work here, but since the late 1950's this mine has been closed because no one needs coal anymore to heat their homes."

"I didn't know there were coal mines in the city." My uncle said something to Anna in Polish and along they went probably talking about the coal mine.

The declivity down the ravine to the coal mine had been freshly plowed by my uncle right down to the gravel roadbed. His vintage 1940's three ton truck was no longer used to deliver coal, but to do sundry things like plow the road after a snow storm. Once we got onto the rock road bed it was smooth sailing down into the ravine and into a parking space near the main building. Most of the parking lot was untouched by the plow and had a good meter of snow.

The main building was a non-descript one storey building with dark green trim and painted white walls. Across the parking lot, in the shadow of the south ravine was a quaint log cabin. Dark smoke drifted up from the chimney in the cabin, telling all for miles around that the building was occupied and in use. This is where my aunt and uncle lived. Feeding the chimney was a cast iron stove, fed with coal from the coal bin, and heating the cabin quite handily.

We alighted from the old Buick, stepping into knee high fresh snow. It always snowed more near the North Saskatchewan River than it did in the city itself. It had something to do with the lower elevation, and the cold air and the moisture wafting up from the swiftly moving waters near the mine. The ravine was once a meander of the North Saskatchewan River but had been pinched off. Eons ago the river stopped flowing through this neck of the woods, but not before it had eroded away enough of the surface soil to lay bare the veins of hard coal. On the side of the ravine coal seams were seen to be poking out. In the summers when I visited I not only searched for choice pieces of hard coal, but the occasional fossil which I trade my classmates for things like comic books or chocolate bars.

We trekked across the parking lot to the front of the cabin. It was a challenging trek for me in pants. It was even more challenging for Anna who was wearing a dress and tights. My uncle took the lead, then I walked a few steps behind him but ahead of her and tried to clear a path for her. She walked along until she suddenly stopped. I could not hear her foots steps and turned around. She was looking around the site of the old coal mine.

My uncles stopped too and looked perplexed at the two of us. He said something in Polish to her and she said something back and then proceeded on his walk to the log cabin.

I stood for a few seconds confused. Then I asked "what's wrong?"

"I asked your uncle if he would let us walk around and explore a bit. I have never visited a coal mine before."

"What did he say?"

Your uncle said to be careful and don't go down into the mine shaft.

I looked at her for a few seconds before I said "you are full of surprises."

"Am I," she responded but with a distant haughtiness. She was turning her head and looking slowly around the yard. I followed her eyes around the parking lot and realized she was studying the fence. It was a sturdy wire fence, held up by wooden posts every twenty feet or so, and topped with coiled barbed wire. There had been some vandalizing of equipment and trespassing of the coal mine and for matter of safety the facility had been fenced off and topped with barbed wire.

Then her eyes fixated on the entrance of the coal mine. There was a large gate that drew into the parking lot. The gate was swung closed and locked each

night at dusk and swung opened again each morning at dawn. It was part and parcel of my uncle's routine.

Above the gate there was the arc of a long faded sign. It was a matter of perhaps a high wind before it came crashing down. The last time we had visited my father had asked for the sign to be taken down before it fell and hurt someone. When he was a bit older than I was then he had been the one to help paint and hang the sign. It was his job to check the spelling that one of the Polish workers painting the sign was to use and of course there is a typo which had been the amusement of all who had visited the coal mine. He had replaced the e in mine with a d. No one ever thought of fixing the mistake. The workers took to calling him coal mind.

Everyone's father was a boy once. I knew the story because my uncle had told it to me, but he had also sworn me to secrecy … My father wanted the sign taken down to *fix* the mistake for good. He wanted to take the sign down, break it apart and throw it into the giant incinerator that was off in the corner of the yard. When we drove in Anna had not noticed the sign and I did not bother to share the joke. She had noticed the incinerator. It was made out of bricks and had a high chimney. The front of it had a large cast iron door which was swung and left open. You could see a dark abyss within it.

Around the base of the fence you could see where my uncle had marched on his sentry duty to see that all was right with the place. For one man to look after the abandoned coal mine was difficult. But my uncle was use to such rigors. He had grown up on a farm east of Krakow in southeastern Poland.

As a young man of twenty he had been a sergeant in the Polish Army in 1939, stationed on the eastern part of Poland which had been invaded by the Red Army in 1939. He had been captured and interned in a Soviet Gulag, along with some 6,600 of his N.C.O. and conscript compatriots and left their to wither away by the Soviets. Stalin hated Poles more than any others. In the gulag the Soviets were using the prisoners as forced laborers to build a new railroad to the Urals. The prisoners were told *hard work would make them free*. Cynically later in the war the survivors would remember this as *Arbeit Macht Frei* …

My uncle's officers had been systematically murdered by the Soviet at Katyn near Smolensk in 1940, as had his mother, my great-grandmother. She had been a stubborn and outspoken woman who merely wanted to know what had become of her beloved sons William and Vincent. She so angered a NKVD major that he drew his pistol and nearly shot her on the spot in full view of his troops. When he calmed down a bit he scribbled something on a piece of paper, handed it to one of the Soviet soldiers and sent my great-grandmother to her death at Katyn. That soldier would later fight beside my uncle and tell him the story of his mother's martyrdom.

In the summer of 1943 the Nazis had found the mass grave of Polish Officers at Katyn and used it to their advantage. They got the neutral Swedes and the Swiss to compile a list of the dead and publicized this fact on behalf of the International Red Cross. The NKVD officer that had martyred my great-grandmother never made it through the war. He was shot by the Soviets for 'cowardice.' More likely the Soviets were just covering their tracks and tying

up loose political ends. It was only in 1991 that Soviet General Secretary Mikhail Gorbachev would apologize to the world for the Katyn massacre.

In the spring of 1942 when the NKVD arrived at their Gulag they told them they had a singular choice – '*fight the Ghhermans with us or we shoot you here and now*.' How could one refuse such an offer at the muzzle of a machine-pistol. When they were told this, this was the first time that my uncle and the other Polish prisoners had heard the Nazis had invaded Russia. That day the Soviets became the lesser of two evils. Of the 6,600 soldiers who set out on their crusade to free Poland that day only 600 survived the Nazis and the Soviets by the end of May 1945.

The Nazis fought like demons, but the Soviets had their own twisted sense of propriety – they would march their 'comrades' in front of the T-34 tanks through mine fields to save the tank from the mines. What was the death of one Polish soldier compared to the saving of a Soviet tank and its tank four man Soviet crew. It was the Soviet version of being a superior race. But ask any Soviet and they will tell you the Poles fought like lions and the Nazis feared the Poles more than they feared the Soviets. It was the same on the Western Front. Where the Poles fought the Germans, the Aryans trembled.

When they invaded Poland in September 1939 the Nazis had gone out of their way to treat Poles like sub-humans. My uncle told me that as they invaded the German's had a marching song that said that *the only good pole is a dead one*. Now the Nazis were receiving their comeuppance. Very little quarter was given to them in the heat of battle.

My uncle met my aunt one cold winter afternoon in 1943 when she was commanding a Soviet T-34 tank. She let the Polish soldiers ride on her tank and it was love at first sight. My aunt had been a rather proficient Panzer buster. She could put a 76 mm round down the barrel of a German tank at a thousand yards. She could knock the tread off a Panzer at a mile. She was so proficient at her job that the Soviets let her make up her own rules of engagement in this game of cat and mouse.

And so she let the soldiers ride on her tank. For some reason the Germans would hesitate to fire their antitank weapons if they saw men hanging on the outside of a Soviet Tank, deciding to use their machine guns instead. This meant they could close the distance. And so she used that to her advantage. In that game of Cat and Mouse the tanker who fired first had a better than even chance at winning the match. If you were as good as my aunt was, it was closer to 90 %. She also had an innate understanding of German field tactics and so she escaped the murderous fire of the 88 mm guns. She was the gem of Rokossovsky's army.

And at night she was never for want of company. She was allowed to keep a gather of a dozen foot soldiers as her protectors – a sort of male seraglio. One of my aunt's most infamous expressions was "*you only live once, and once is not enough*." It is a wonder she didn't get pregnant while driving her tank.

Between battle after battle, across the wide and flat expanses of Eastern Europe, my aunt and uncle would romance from Lvov, to Krakow and on to

the Elbe. He was a tall and handsome fellow. She had been a petite beauty. She lost three T-34's and several crews under her but somehow she managed to survive. It was not sheer luck but an inner wisdom that one could not put into words.

Her last T-34 she lost when at the outskirts of Dresden three Tiger tanks tried to maul her. In a street battle that lasted nearly two hours she took them all out. One she put a round down the barrel. The second she caught it by the ass and destroyed its diesel and in the third battle she brought the building it was crouching in down up on the Tiger. I doubt they were able to dig the crew out. It was then that her tank was taken out by a German soldier with a Panzer Faust.

Her crew survived the bazooka round and chased the German soldier for the rest of the afternoon before cornering him and finishing him off. I guess I should tell you, that T-34 had an all woman crew. They raped him, then emasculated the boy and threw him out of a second story window. He was dragged away and perhaps survived. My aunt was not there to tame her crew. She had suffered a concussion from the Panzer Faust and was sleeping it off in my uncle's arms.

My aunt and uncle fought alongside each other for eighteen months. By the time they got to the Elbe they were engaged. Along the way they would liberate Birkenau and Auschwitz. I had told Anna this story a week or two before and she has listened quietly. Inside I knew this was a reason for Anna

wanting to meet them. That afternoon Anna had told me that her mother and grandmother had been internees at Auschwitz.

It was when Anna started to walk towards the main building that this brought me out of my daydream. The snow crunched under her feet. Her pace was rapid and deliberate. She took no notice of me. It took some effort on my part to catch up with her.

She got to the stairs before I did and opened the door. The door swung freely open. I was surprised it was unlocked. She flicked on the light and stepped inside the antechamber. She took several steps in and stopped. It was when she stopped that I entered the room behind her. I stood without making a sound. I watched her closely. She moved as in a trance.

The main building housed the change rooms and showers. It was colder inside the building then outside. You could see your breath in the starkness of the three light bulbs that ran the oblique length of the room.

The Anna started to do something I had not expected. She unwrapped the scarf from around her neck and let it fall to the floor. Then she unbuttoned her coat and let it fall too. In the middle of the room she started to undress.

"What are you doing Anna?" She didn't hear me. I walked rapidly to in front of her and grabbed her arms. She did not seem to see me. She pushed my hands away and struggled free and continued to undress. Her dress dropped

to the floor. She stood in front of me in her brassiere, panties and tights. She kicked off her shoes.

"Anna … Anna!" Still she didn't hear or see me. Her eyes were mad. They looked around as if she were not alone in the room. She started to cry as she took her brassiere off and let it fall to the floor onto the stack of her clothes.

"Stop … what's wrong?" I started to feel a fear that she was having an episode or something. She said something in Polish. I did not understand what she said.

Then down came her tights. She bundled them up and then tucked them into her clothes and stood for a second in her panties. I could feel her body heat standing next to her. She was looking up at a make-believe person next to her and speaking softly in Polish. I did not know what she said but I suddenly understood what was happening. Her mother had been her age when she had arrived in Auschwitz. Anna was recreating the trauma of the arrival.

At that moment she wasn't in my world anymore and so I did not know what else I could do then to start taking off my clothes and joining her in her nightmare. If I did not do this she would be all but alone in her trauma. I wondered if her solitude would break her.

It was very cold in that room. I was glad that my boyness all but tucked itself in me. Never had I felt more vulnerable than then. She looked at me then dropped her panties and took my hand and led me into the next room. Her

steps were hesitant and knowing. She feared what was in the next room. We got to the door and stopped. She flicked on the lights and only two bulbs, one near the door and one at the far end came on.

Midway in the room there was a shower fixture that dripped onto the floor below. There was a stalagmite icicle growing up from the floor. It glowed in the dim light of the room.

As we stood at the door I looked at her. Her skin was soft and pink. Her small breasts were majestic in my eyes. They seemed to have grown in the space of a few minutes. Her femininity was more pronounced then it was when I glimpsed it yesterday. It had the shape and colour of pink tulips. I could see a small swelling in the midst of her that I had not seen before – a sort of girl penis, if such a thing existed. In the midst of the garishness of things she was very incredibly beautiful.

I squeezed her hand and she held my hand even tighter. She was about to take a step into the room when something seemed to hold he back and she stepped back into the antechamber. And there we stood for a few minutes at the door to the showers, listening to the drip, drip, drip of the water under the stalagmite.

I started to shiver. But there she stood aglow and in her own world. "Anna …" still no response. When I said her name she squeezed my hand even more. My fingers began to hurt under her grasp. But I didn't say anything. If she could survive the cold, I could for her sake.

We probably would have stood there for many more minutes were it not for a word being yelled out by my aunt. "Dziechi! …. Dziechi! …" It was Polish for children … children.

Anna started to relax her grasp on me and she began to return to my world from her world. Then she came too and noticed that we were both standing there at the door to the shower room naked like the day we were born. She looked at me and started to cry. What else could I do but bring her close to me and hug her. "Everything will be all right Anna."

"Dziechi! …. Dziechi! …"

She started to shiver. She felt so warm so I knew it was not the cold that was causing this. It was fear.

"Anna … are you ok? Where were you just now?"

She looked at me with scared eyes. "My mother and grandmother told me all their stories about being at Auschwitz."

"Is that where you were just now?" I asked her.

She nodded. "We are not there now …" I tried to sound so convincingly as I said this. "We are here in Edmonton and it is 1973!"

She held me even closer. Her breasts pressed against me. I began to stir. For a boy it is almost automatic. I felt the awkwardness of this as my boyhood crept up her leg.

She started to whisper in my ear. "My mother and grandmother where sent to Auschwitz in the fall of 1943. The day they arrived they were to be marched into the showers … but were saved at the last moment by an SS oficer."

"Saved?" I asked.

"My mother and grandmother are tall, blonde and had blue eyes. He pulled them aside and the officer asked my grandmother some questions. They came from a part of Poland, Silesia, that had many German migrants. My grandmother and mother could speak German and so she told him a white lie – that her grandparents came from Germany."

She stopped and looked at me. She felt me between her legs and did not seem to mind. I was now fully erect and so she pushed her pelvis closer to mine and our intimacy was all but complete.

"The officer asked her what my grandmother did. She said had been a nurse and mid-wife in Wroclaw. When he asked about my mother she told him she was a nurse's assistant. This is what saved their life!"

My backside was chilled but my front was not. In the distance I could hear my aunt calling us again. "I think we should dress and go back."

Then Anna did another unexpected thing. She kissed me passionately on the lips and not just for a second or two but for a good fifteen seconds. As she did this the furnace within her burned even more warmly.

She then danced upwards on her toes a few millimeters until her tulip was just touching the bud of me. As we stood precariously we were both at the portico of life. I dropped myself down a touch and then I was being caressed by the most incredible silkiness of life. Her soft skin touching my soft skin. There we stood for a moment both unsure. Then the kiss was over as was the temptation.

I was glad. She turned away and started to dress. We were back in the real and the present. My clothes were stone cold when I put them on. Strangely I had felt warmer without them on. Once again I had to catch up with her and gladly we were very much ourselves when in the doorway of the building my uncle appeared, no wiser to what we had just been through.

"Your aunt has been calling you. Where have you been?" he asked us sternly.

Anna said something in Polish and my uncle turned back out of the door and started to walk back to the cabin.

We both walked to the door and stopped. She took my hand and gave it a tight squeeze.

“What did you say?”

“Here and now …”

We walked slowly back to the cabin. The smoke rising from its chimney was beckoning. But she took her time and spoke as we walked.

“At Auschwitz there was a ward in the hospital just for pregnant woman. There was a Polish mid-wife there named Stanislawa Leszczynska who delivered over 3,000 babies from 1942 to 1945. My grandmother and mother worked in that ward from 1943 helping to deliver about 1,500 babies. It was hard for them to do.”

“Why?”

“After the mothers gave birth to their babies the woman were sent to the showers that very same day by the chief Doctor, Mengeles.”

“My god – that’s monstrous! What happened to the babies?”

“If it was a healthy girl it was sent for adoption in Germany.”

I paused before asking, because I didn’t really want to know. Anna looked at me but stayed silent.

“Do I want to know what happened to the little baby boys?” She shook her head.

We walked along a few more steps before she said something else. “In 1944 there was a bad typhus epidemic in Auschwitz. My grandmother came down with it and my mother nursed her back to health. Then my mother came down with Typhus. One morning when she had yet to recover Herr Doktor Mengele came to do his rounds. If you were not well enough to work he sent you to be gassed.

My mother had not been out of bed for a week, but that morning she stood all by herself next to her bed and did not move an inch as Mengele stopped at her bedside and looked both at her and the empty bed. She smiled back as he asked her where the patient was who had been in that bed.

“She’s not here anymore Doktor. I am to here to change the sheets.” Mengele finished his rest of his rounds and left the ward. “My mother had lied her way out of death.”

As she finished her story we stepped up onto the porch of the log cabin. My aunt had been waiting for us and ushered us both in. Giving both Anna and I a big hug. My aunt took one look at Anna and knew she was chilled to the bone and so she took helped her out of her scarf and coat and towards the bathroom. She said something to my uncle who lifted a large pot of boiling water off the coal stove and into the bath room. When he reappeared the pot was empty and he handed me the pot and said go get some water.

I turned around and walked out to the hand pump beside their cabin and pumped the handle a good five or six times before water issued from the spout. It took me several trips before the bath tub was filled with the right mix of hot and cold, then the pot was put back on the stove and a smaller bucket handed me. I think I made seven or eight trips in all. By the time I was told there was enough water I was sweating under the exertion. I did not mind. I was doing this for my friend.

On the stove was set the pot and water was being boiled for my bath. My aunt said something to my uncle in Polish and my uncle, who was sitting comfortably in his chair next to the stove said something back. Then Anna said something in Polish from with the bathroom and my uncle smiled. My aunt asked Anna something and Anna said something back and before I knew it my aunt had taken me by the hand and had walked me into the bathroom and closed behind me.

There was Anna in the bath. She smiled at me. "You aunt asked you uncle to get water for your bath. He didn't want to get water for your bath and so I said you could share my bath water."

"Your aunt thought this was funny. You uncle doesn't care …. Just don't make babies he said."

Just before I was to step into the bath my aunt appeared with another ladle of hot water. I bashfully covered myself. She said something to Anna, who giggled in response.

"What did my aunt say?"

"She said we would make a lovely couple."

My aunt looked down at my hands and laughed. Without asking Anna translated what my aunt said. "Don't be bashful … it's not as if I will see something I haven't seen. I have had several babies for god sake."

My aunt pointed to the bath. "Get in before the water gets cold."

Oh well so much for modesty. I obliged. I slowly and carefully stepped into the bath. The water was painfully hot on my frigid skin. When I was finally fully in the bathtub then we were once again alone.

I sat in front of her, between her legs, leaning forward. Behind me I could feel her hands on my cold back. "Let me I wash your back," she said.

The touch of her hands, and the slippery warmth of the soapy water, was indescribable. Where moments before we had been at the gates of hell, here within our own beloved world we were now in heaven.

When she was finished washing my back I leaned back against her. Her breasts once again pressed against me and once again I stirred. She placed her hands on my stomach. I placed mine on her knees. Somehow I knew that that moment would bring her happiness for the wholeness of her life.

She had fingernails painted with pink polish. Seeing such feminine hands so close to the maleness of me meant that I stayed stirred for a very, very, very long time. No doubt hidden behind me, out of my view, was a similar arousal. It was love between boy and girl without intercourse.

Quietly we enjoyed our bath uninterrupted until we both felt it was time for us to rejoin the rest of the world. Eventually there was a knock on the door and my aunt asking whether we were hungry. She had made us Borscht.

Anna whispered into my ear. “It is a pity we could not stay in the here and now.” I turned my head and looked back at her as she said this. We kissed. Anna looked wonderfully happy. Her trauma was behind her.

She had nothing to be sad about … and neither did I.

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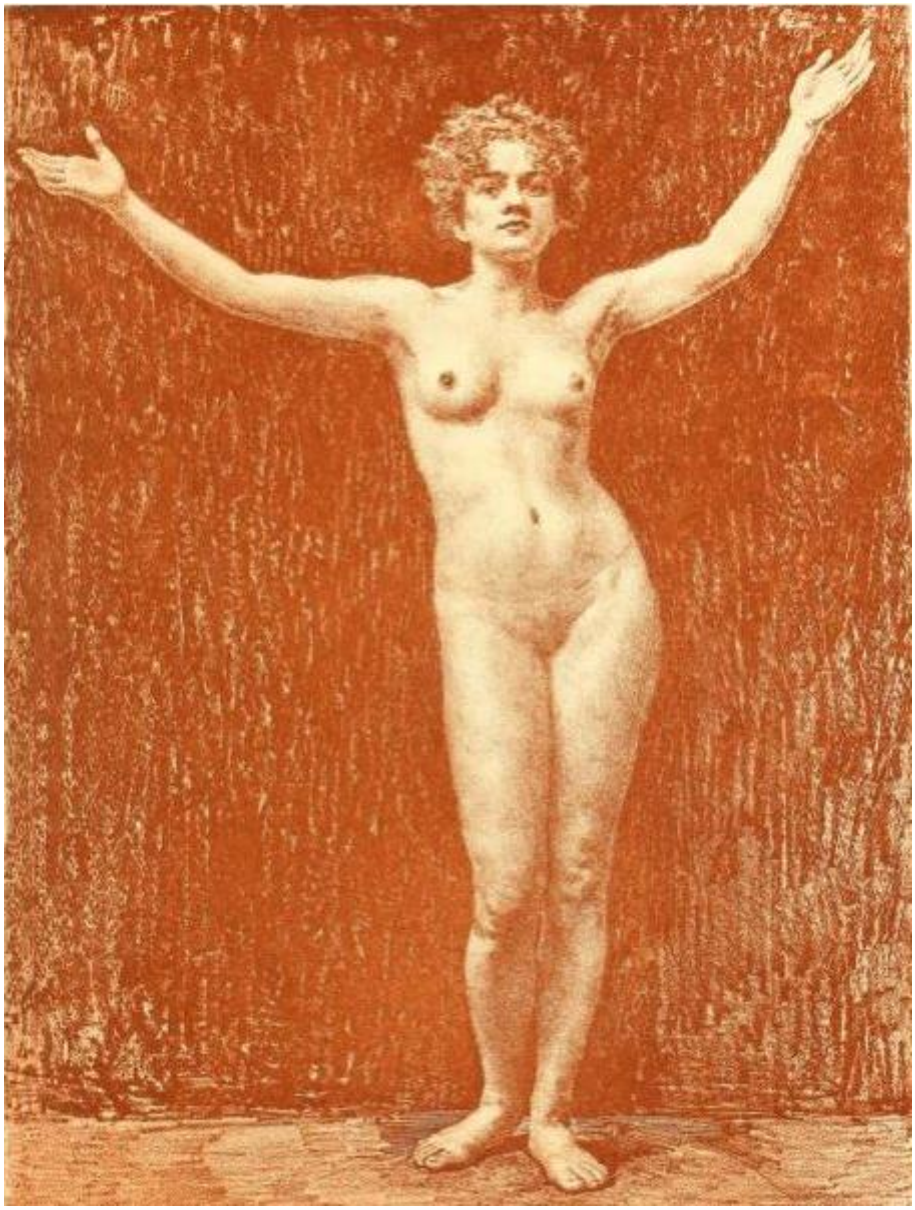


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